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ASSAY OF ATROPIA IN EXTRACTS OF BELLADONNA.

BY JOSEPH LE ROY WEBBER, PH.G.

(*Extract from an Inaugural Essay.*)

In order to determine the relative value of inspissated juices and alcoholic narcotic extracts, commercial and officinal, an assay of the alkaloid in one of the most important of this class, namely, the extract of belladonna, was made with care and accuracy.

Extracts of belladonna were purchased, representing the principal houses of this country, and those of Europe which have a very extended sale in this country. When purchased, each package had on it the manufacturer's label, and was in the original package. The process for determining their value was as follows: 10 grams of the extract was treated with an equal weight of water, and subjected to a gentle heat until the extract was reduced to a syrupy consistence. 90 c.c. of alcohol was then added, digested and strained, and the residue treated, 3 times successively, in a similar manner. To the mixed liquids 4 grams of lime was added, previously hydrated and in powder, and the flask frequently shaken during twelve hours. The lime decomposes the salt of atropia, and removes the organic acid and coloring matter by subsequent filtration. The filter was washed with alcohol; diluted sulphuric acid was then added to the filtrate, until the liquid acquired an acid reaction, and the precipitate of sulphate of calcium and coloring matter removed by filtration, and the filter washed. The alcohol was then removed by evaporation, in divided portions, at a gentle heat, water added to the mixed liquids and thrown on a wetted filter, and sufficient water added to the filter to make the solution of sulphate of atropia measure 100 c.c. The atropia having been separated from much of the coloring matter, the quantitative results were obtained by Mayer's process, namely, a volumetric solution of iodohydrargyrate of potassium, or rather of corrosive

sublimate, in excess of iodide of potassium, the strength of which solution was 13·546 grams of corrosive sublimate, and 49·8 grams of iodide of potassium, per litre. Of this solution 1 c.c. will precipitate ·0145 of a gram of atropia. Experiments were first made with a known quantity of pure atropia, dissolved in water and dilute sulphuric acid, in order to become acquainted with the process and to insure correctness with the solution prepared. In each case not less than three titrations were made.

TABLE OF RESULTS.

MANUFACTURER.	Test solution requisite for 100 c.c. of extract solution.	Indicating atropia.	Percentage of atropia in extract.
Extr. Belladonnæ Alcoh. U. S. P.	17·732	·2571	2·571
Lazell, Marsh & Gardiner,	17·33	·2511	2·511
Parke, Davis & Co.	16·264	·2358	2·358
Burrough Bros.	16·264	·2358	2·358
Henry Thayer & Co.	12·666	·1836	1·836
Tilden & Co.	12·4	·1798	1·798
Chas. Ellis' Son & Co.	12·133	·1759	1·759
McKesson & Robbins,	11·71	·1697	1·697
E. Merck (alcoholic extract),	10·26	·1488	1·488
Geo. Allen & Co.	9·73	·1411	1·411
Herrings & Co.	8·133	·1179	1·179
Mt. Lebanon, N. Y. (inspissated juice, 6 years old),	6·24	·0904	·904
E. Merck (aqueous eqtract), made 1869,	1·9	·0275	·275

These results lead to the following conclusions:

1st. That the American extracts of belladonna contain a larger percentage of atropia than the imported, the reason for which, doubtless, is the mode of manufacture; while the former are generally made from the imported leaves, by the use of alcohol and subsequent evaporation, the latter are made from the expressed juice.

2d. That the extracts which stood lowest in the list of assays were aqueous extracts. The two lowest containing but ·9 and ·27 of one per cent. of atropia, and since the date of manufacture of both was 1869, it tends to show the unstability of such preparations. There can be no doubt but that, at a recent date of manufacture, aqueous extracts of belladonna, and, perhaps, of hyoscyamus and conium, are of better quality, but if, in a few years, they deteriorate to worthless extracts, is there not good ground for saying that the class of inspissated juices of narcotic plants are unstable, unreliable, unsafe and not worthy a place in the U. S. Pharmacopœia? I say unsafe, for, if a

worthless article is used by a physician, and he does not perceive the desired effect, he will increase the dose until obtained, and consequently give much larger doses than if he were dealing with an extract of good quality; but when he obtains the extract of good quality, the continuation of the same large doses might prove fatal.

In closing this paper, I would suggest a similar examination of the extracts of hyoscyamus and conium, as this is a subject of interest and importance to the medical and pharmaceutical profession.

DOES VERATRUM VIRIDE CONTAIN AN ALKALOID OTHER THAN JERVIA?

BY CHARLES BULLOCK, PHILADELPHIA.

While engaged on the experiments with jervia, published in Vol. 47, page 449, of this Journal, my attention was directed to the circumstance that the portion of the alkaloid taken up by ether (veratroidia), when dissolved in acetic acid gave a copious precipitate on addition of a solution of nitrate of potassium. This reaction appeared to indicate that the greater part of this product was jervia, which, under some favoring conditions, had dissolved in the ether.

With a view of investigating the subject, as also to look more carefully for *veratria*, if any existed in the drug, the old method of obtaining the alkaloid as described in my paper, Vol. 37, page 321, was retraversed, with some modifications which afforded better results in the amount of product obtained.

The fluid extract of veratrum viride was poured into water, acidulated with acetic acid (free from sulphuric and hydrochloric acids), the resin separated by filtration, and the clear liquid concentrated by evaporation until all the alcohol was expelled. Precipitation was then effected by caustic soda (in place of carbonate of soda).

The resin was dried, powdered and digested in warm water acidulated with acetic acid, and the filtered solution precipitated by soda. Finding the resin still contained some alkaloid, it was treated with a warm solution of caustic soda, which dissolved the resin readily, leaving a sediment, which was thrown on a filter and washed until the washings were without color. This precipitate was dissolved in dilute acetic acid and reprecipitated by caustic soda. From the resin representing one pound of the root *eight grains* of impure alkaloid were

obtained. The whole of these impure products were mixed together, dried, redissolved in acetic acid and precipitated by caustic soda. After washing and pressing between folds of bibulous paper, it was dissolved in alcohol, digested with animal charcoal, filtered, and evaporated to dryness. A semi-crystalline mass was obtained, weighing thirty grains (from one pound of root).

The alkaloid was powdered and digested with *washed* ether. The ethereal solution left on evaporation a light-colored resinous coating adhering to the upper surface of the capsule, with a crystalline deposit at the bottom.

This product weighed eight grains, and represents the supposed "*Veratroidia*" existing in the drug, and should also contain veratria, if any was present. An examination of its character was made as follows:

Treated with warm dilute acetic acid, it afforded a turbid solution, with finely divided insoluble matter held in suspension. After filtration, it was precipitated by caustic soda, and the precipitate washed in a filter with a warm solution of soda. The alkaline washings (A) were reserved, and the alkaloid washed with water to remove the alkali, pressed and dried.[1]

Character of the Precipitate.—When dry, it had a light yellow color. A portion dissolved in acetic acid (the acid being in excess) gave with a solution of nitrate of potassium an abundant precipitate characteristic of jervia. This precipitate dissolved on heating the solution, and crystallized out on cooling.

Heated on platinum foil, it charred and left a residue when incinerated to whiteness; the grey ash dissolved without effervescence in dilute nitric acid; this solution was divided into two portions. To one was added ammonia and oxalate of ammonia; the usual reaction of *lime* was obtained. To the other acid portion a solution of molybdate of ammonia was added; after standing two hours, a deposit of phosphomolybdic acid was obtained.

The alkaline washings (A), after neutralization with hydrochloric acid, were evaporated to dryness, the product powdered and exhausted with ether. The ether left, on evaporation, a small amount of resinous matter, which gave the following color reactions:

[1] An after examination of the soda by alcohol used, showed it to contain traces of alumina and magnesia.

With hydrochloric acid, a light pink color in the cold; on heating, the color passed to a brownish-yellow.

With sulphuric acid, a turbid yellow color, soon changing to a mahogany color, passing eventually to brown.

Heated on platinum foil, it burned with a smoky flame, and left no residue.

At this stage of proceeding the question arose, Can veratria be recognized by *color tests* in the presence of an excess of jervia? To determine the question, ten parts of commercial veratria were intimately mixed with one part of crystallized jervia. The color reactions were as follows:

With concentrated sulphuric acid, gives a yellow color, changing to a reddish brown, surrounded by a margin of green.

With hydrochloric acid, in the cold, a faint pink seen on the upper margin; on heating, a brownish-yellow color. The purple-red color of veratria does not appear, neither does the greenish hue given by jervia alone.

The reactions of veratria were so masked by the jervia that *no correct judgment* could be expressed that veratria was present.

Veratria is soluble in ether; according to Fresenius, less soluble than in alcohol, when the veratria is pure.[1] Jervia, when pure, is almost insoluble in ether, but in the presence of the associated resin it dissolves to a limited extent; hence a separation of the two alkaloids by ether cannot be effected so long as resin is present. The jervia must first be removed; to effect this object, I took advantage of the insolubility of nitrate of jervia in a solution of nitrate of potassium. One part of pure jervia in 1000 parts of water (acetic solution) is precipitated almost immediately on addition of a solution of nitrate of potassium in excess; complete precipitation is not effected if any resin is present. The precipitate is not soluble in excess of acetic acid; it dissolves on heating the solution, and crystallizes out on cooling.

Veratria, when dissolved in acetic acid, one part in sixty, the solution containing excess of acid, is not disturbed by addition of a solution of nitrate of potassium. If a large excess of the potassium solution is added, it causes a slight cloudiness, which does not disappear on the application of heat. After standing twenty-four hours, no precipitation of the alkaloid takes place.

[1] See Fresenius' "Qualitative Analysis," American edition, 1865, page 404.

A portion of the "veratroidia" was then digested in a solution of caustic soda to remove as much resin as possible; after washing, it was dissolved in dilute acetic acid, precipitated by soda, washed, again dissolved in acetic acid, and a solution of nitrate of potassium added (causing an immediate precipitate). After standing twelve hours, the solution was filtered to free it from nitrate of jervia; addition of caustic soda now produced but a small amount of precipitate, this had a light yellow color and reacted as follows:

With sulphuric acid, an evanescent purple, changing immediately to brown, then passing to a mahogany red.

With hydrochloric acid, in the cold, an immediate purple-pink; on heating, the color becomes greenish-yellow.[1]

The remainder of the product was then dissolved in acetic acid, addition of nitrate of potassium again afforded the jervia reaction.

The color reactions, as shown, are of little value in determining the presence of veratria mixed with jervia; the continued precipitation caused by nitrate of potassium, as the resin is more perfectly removed, points to the conclusion that jervia and resin make up the product called "veratroidia."

EXPERIMENT SECOND.—Having ascertained that muriate of jervia, as also muriate of veratria, were soluble in a menstruum composed of alcohol, one part, and water, two parts, acidulated with hydrochloric acid, the following method of obtaining the products from the drug was tried:

PART FIRST.

Take of	Powdered veratrum viride root,	5	pounds
	Clean sand,	10	"
	Alcohol, 95 per cent.,	10	pints
	Water,	20	"
	Hydrochloric acid,	7½	fluidounces

The powdered root mixed with the sand was moistened with the menstruum. After standing twenty-four hours it was transferred to a glass percolator and displaced with the remainder of the menstruum. Displacement was then continued with water until thirty pints of percolate was obtained. The alcohol was distilled off and the watery solution evaporated to five pints. To this a solution of caustic soda was added to decided alkaline reaction, to dissolve the resin and pre-

[1] Pure veratria gives no color when dissolved in hydrochloric acid in the cold.

cipitate the alkaloids, and the whole thrown upon a filter of strong paper. After draining off the dark liquor, the contents of the filter were washed until the filtrate was almost without color. The solid matter in the filter was then partially dried and digested in a warm solution of acetic acid. After filtration the acetic solution was precipitated by soda, washed, pressed between folds of bibulous paper, and digested in hot alcohol, with addition of a little animal charcoal. The alcoholic solution was evaporated until precipitation commenced. On cooling it formed an almost solid crystalline mass. When dry, this product weighed eighty grains.

It was dissolved in dilute acetic acid, and an equal volume of cold saturated solution of nitrate of potassium added, causing an abundant precipitate. After separating the nitrate of jervia, the mother-water was precipitated by soda, the precipitate washed, dried and digested in washed ether. The etherial solution yielded a residue on evaporation weighing about *two grains*. An examination of this product proved it to be jervia mixed with resin.

PART SECOND.

After draining the liquid from the drug in the precolator displacement was continued with strong alcohol, until the root was exhausted; two pints of water were added to the precolate, and the alcohol removed by distillation. The resinous residue left on evaporation was treated with a warm solution of caustic soda until the resin was dissolved, then diluted with water and set aside to settle. After decanting the dark supernatant liquor, the precipitate was thrown upon a filter, washed, treated with a solution of warm acetic acid, and the acetic solution precipitated by soda. After washing and pressing between folds of paper, the precipitate was dissolved in hot alcohol and digested with animal charcoal; the alcoholic solution, on evaporation and cooling, deposited the alkaloid in fleecy prismatic crystals, having a rosy tinge of color. Washing in a filter, when nearly dry, with ether, removed the coloring matter and left the product almost colorless. The amount of alkaloid obtained was 42½ grs.; this added to the 80 grs. obtained by the first process with hydrochloric acid and dilute alcohol, gives 122½ grs. crystallized jervia as the yield from five pounds of root.

The examination for veratria was conducted as follows:

After most of the jervia had crystallized out from the alcoholic solution, and resinous and coloring matter commenced depositing, the solu-

tion was evaporated to dryness, the product dissolved in warm dilute acetic acid, and precipitated by a solution of nitrate of potassium. After standing 24 hours to allow the nitrate of jervia to crystallize out, the solution was filtered and precipitated by caustic soda, and the precipitate washed with a warm solution of the alkali, which removed considerable coloring matter. It was then redissolved in acetic acid, the jervia again separated by nitrate of potassium, and the mother-water precipitated by soda. This operation was performed the third time, after which nitrate of potassium no longer caused a precipitate. When heated on platinum foil the product burned with a smoky flame and left a residue; in dilute hydrochloric acid, it dissolved without effervesence. Addition of ammonia (containing so little carbonate as not to disturb a solution of acetate of lime) afforded an immediate precipitate; after separation of the precipitate, oxalate of ammonia afforded the usual reaction for lime. The product was therefore lime-salts, resin and some alkaloid. To separate these, the product was dissolved in alcohol, filtered and evaporated to dryness; this was treated with ether until exhausted, and the ether allowed to evaporate spontaneously. The residuum insoluble in the ether was fixed when tried in the flame. The ether left, on evaporation, a central portion of white crystalline product, with the upper margin surrounded by a non-crystalline, light-colored resinous-looking matter. An examination of both of these products separately gave no indication of the presence of veratria. The whole of this ether product was then treated with dilute acetic acid; a turbid solution was obtained, with finely-divided insoluble matter suspended (resin). After filtration, addition of a few drops of a solution of nitrate of potassium gave an immediate precipitate of nitrate of jervia.

The Resin, which was dissolved by the solution of caustic soda, was precipitated by dilute sulphuric acid, well washed, dried, powdered, and treated with rectified petroleum benzin; the benzin solution left on evaporation a light-colored, fatty matter, which solidified on cooling.

The resin was then treated with washed ether until exhausted; on evaporation, the ether left a dark red translucent resin. (This resin was entirely insoluble in warm dilute acetic acid, but when triturated with precipitated carbonate of lime, a portion afterwards dissolved with the lime in acetic acid, and was precipitated with the lime on addition of caustic soda, containing a little carbonate; excess of soda did not

remove *all* the resin from the precipitated carbonate of lime. After drying the precipitate, it yielded the resin to ether. This experiment demonstrates the manner in which this resin follows the alkaloid containing earthy salts in dissolving in acids, and precipitating with it on addition of alkalies.)

The resin was dissolved in alcohol and digested with animal charcoal, until most of the color was removed. The alcohol left, on evaporation, a soft resin. This resin reacts with strong sulphuric acid in a manner well calculated to *suggest* the presence of veratria,—giving a brownish-red color passing to a cherry-red, and finally to a mahogany color. After standing some hours the solution looses its color and carbonized particles separate.

To hydrochloric acid in the cold, this resin imparts a light pink color.

The resin was treated with warm acetic acid, and found to contain no alkaloid.

As the result of these experiments we find jervia to be the only alkaloid in the root of veratrum viride. The so-called veratroidia is a mixture of jervia with a light-colored resin; the larger the amount of this resin present, the greater will be the proportion of jervia taken up by ether. In the first experiment we had eight grains dissolving in ether out of thirty; in the second, where the resin was more completely removed by caustic soda, eighty grains yielded but two grains to ether.

The reaction of the alkaloid with sulphuric acid, hitherto considered to indicate the presence of veratria, is due to a resin which is taken up by ether, and which adheres with great persistence to the alkaloid, dissolving and precipitating with it.

The interesting question arises, to what are we to attribute the marked difference in the physiological effects shown by experiments made with jervia and "veratroidia?" It must be attributed to the resin—either *per se* or as modifying the effects of jervia. The subject is worthy of further investigation.

To obtain jervia entirely white, the nitrate is decomposed by digesting it with a solution of caustic soda, washing, redissolving in acetic acid, precipitating by soda, dissolving in hot alcohol, evaporating and crystallizing. It crystallizes in white prismatic crystals resembling sulphate of morphia. These crystals fuse at 380° to 385° F., and are insoluble in ether. From acetic solution caustic alkalies, including

ammonia, precipitate jervia completely;—the precipitate is insoluble in an excess of these precipitants.[1]

ASARUM CANADENSE AS AN INDIGENOUS AROMATIC.

BY ALBERT H. VAN GORDER, PH.G.

(*Extract from an Inaugural Essay.*)

This officinal drug, which has been placed in the secondary list of our "Pharmacopœia," is known under the popular names of wild ginger, Indian ginger, colt's foot root and Canada snake root, and is used instead of ginger by the country people in some parts of New England. On account of its medicinal properties, it has been noticed by all our writers on native medicines; but further than occupying a place in our Materia Medica, it seems to be very little used in regular practice.

That the rhizome possesses properties adapting it to be classed with the aromatic stimulants, is shown by its constituents, as given by Bigelow, Rushton and Procter. According to Rushton, it contains gum, starch, resin, fatty matter, chlorophyl, volatile oil, salts of lime, potassa and iron, to which may be added lignin. Of the volatile oil he says: "It is of a light greenish-yellow color, having a warm, slightly bitterish aromatic taste, and contains all the virtues of the plant."

Wm. Procter, Jr., has extended our knowledge concerning the volatile oil, and medicinal properties of the root. He says: "The essential oil seems the most energetic element; the root possessing neither emetic nor cathartic properties, but is an aromatic stimulant with diaphoretic powers. It contains neither asarite or asarum camphor, nor substances analogous to them." It is thus seen to possess none of the emetic or cathartic properties of its congener, the Asarum Europæum, which would render it unfit for use as an aromatic.

It would seem strange that, possessing, as this root does, such pleasant and strongly aromatic properties, its use should be so limited. Doubtless, this neglect is, in a great measure, owing to the want of

[1] After completing these examinations, my friend, George J. Scattergood, kindly placed in my hands his original notes, with samples of the products obtained by him from Veratrum viride in 1862. The products marked "veratria," I found to be jervia mixed with the peculiar resin which gives a mahogany red color with sulphuric acid. They correspond with the product called "veratroidia," an examination of which was one of the objects of the present investigation.

suitable pharmaceutical preparations which might be offered to the physician. If the aromatic properties of this drug, which is easily obtainable, can be exhibited in such a way as to be substituted for the more costly ones now used in so many of our officinal preparations, there can be no reason why it should not be done, for it would certainly afford these preparations at a much less cost to the pharmacist.

Joseph L. Lemberger ("Proceedings Am. Pharm. Asso.," vol. xvii, page 382) recommends the substitution of asarum and calamus for the cardamom in extract. colocynth. comp., and says, "We can easily dispose of cardamom, and substitute some of our indigenous aromatics."

With a view of making some pharmaceutical preparations of asarum which might serve the physician as a vehicle or adjuvant, the writer has made several experiments, the results of which he submits to examination. Before attempting the preparations, however, experiments were made, in order to become better acquainted with the constituents furnishing the aromatic properties of the root.

Eight ounces of the dried root was ground, and macerated with five pints of water for twenty-four hours; introduced into a copper still, and two pints distilled over. This distillate was of a milky appearance, having a layer of volatile oil on top. The volatile oil being separated, the water was saturated with sodium chloride and redistilled as long as the second distillate came over odorous—amounting to one and a-half pints. The second distillate was slightly milky, having small oil globules on the surface. The oil being separated by means of a pipette, the water was again treated with sodium chloride, and distilled. This time twelve ounces were obtained, having odor and taste of volatile oil. The small portion of oil floating on this distillate was separated, and the water, for the third time, saturated with sodium chloride and distilled. After four ounces were recovered, the water passed over odorless and tasteless. The oil floating on this fourth distillate was in such minute quantity as to be with difficulty separated. The volatile oil thus obtained amounted to 2 per cent. of the root employed, and corresponded to the description given of it by Rushton and Procter.

The mother-liquor left in the still after each operation, consisting of a saturated solution of sodium chloride, was found to still contain organic matter. Four portions were agitated with ether, chloroform, gasolin and bisulphide of carbon, respectively, each separated, and

evaporated spontaneously, leaving, in each case, a slight residue. Ether appearing to be the best solvent, the whole of the mother-liquor was agitated with it, the supernatant liquid separated, evaporated spontaneously, residue dissolved in alcohol, and again evaporated. A soft resinous product was thus obtained, neutral to test-paper, having a strong, agreeable odor, entirely different from the volatile oil, and peculiar to itself. It possessed a warm, pungent taste, quite lasting. The amount of this principle obtained was too small to institute any further experiments. It would seem from this, however, that we are not to look upon the essential oil as the only volatile constituent representing the aromatic properties of the root; for this new volatile principle, although in very small quantity, exhibited its characteristics in a very distinct manner, thereby being easily distinguished from the volatile oil.

In addition to these volatile principles, asarum also contains considerable amount of a resin which is by no means inactive. In preparing a fluid extract and tincture, alcohol was used as menstruum, for the purpose of obtaining all this resin. Using ether as menstruum, an oleo-resin was first prepared.

Eight troyounces of the dried root, sufficiently fine to pass through a No. 40 sieve, was precolated with stronger ether, until the precolate passed through colorless. The greater portion of ether was recovered by distillation, the remainder evaporated spontaneously, leaving an oleo-resin of a liquid consistence, amounting to 10 per cent., by weight, of the root employed, and possessing all the properties of the drug.

A fluid extract was made according to directions given by Parrish, in his second-class of fluid extracts.

Several tinctures were prepared, using different proportions of alcohol and water; but alcohol (sp. gr. ·835) seemed to afford the best menstruum. The strength of the tincture made was four ounces to the pint.

From the fluid extract two syrups were made, one possessing the virtues of the resin, as well as the volatile oil, while the other was deprived of the resin by trituration with magnesium carbonate. A marked difference was to be observed in the taste as well as appearance of these two syrups. The one freed from resin was, of course, much the handsomer, being transparent and of a dark amber color, while the one containing the resin, although of a lighter color, was hardly transparent. The first syrup would be the best for use where

only a flavoring ingredient is wanted; but where something is needed to disguise the taste of a medicine prescribed, the syrup containing the resin would answer an excellent purpose, as it has a very strong taste, precisely like that of the root, and at the same time so pleasant as to be agreeable to the taste of almost every one.

The preparation of the above syrups may be comprised in the following formulæ:

Syrup of Asarum (first process).

Fl. ext. of asarum,	f℥i
White sugar,	℥xv
Water,	f℥viii

Triturate one-half the sugar with the fluid extract, and heat moderately to evaporate the alcohol. Add the remainder of the sugar, then the water; raise to boiling point, and strain.

This gives rather more than a pint of syrup of a light color, and with only a slight turbidity.

Syrup of Asarum (second process.)

Fl. ext. of asarum,	f℥i
Magnesium carbonate,	grs. cxx
White sugar,	℥xv
Water,	f℥viii

Rub the fluid extract with the carbonate of magnesium and a small quantity of sugar, and then with the water, gradually added, and filter. To the filtered liquid add the remainder of the sugar, dissolve with the aid of a gentle heat, and strain.

NOTE ON SYRUP OF FERROUS IODIDE.

BY J. F. JUDGE.

(*Read before the Cincinnati College of Pharmacy.*)

When proper care is taken in the preparation of Syrup of Ferrous Iodide, a product is obtained of a pale green tint, which, if kept in full and well stopped bottles, does not change color; but it occasionally happens that from some defect or other in the process, the syrup does not retain its pale green, but assumes a brownish hue.

Some years since, hyposulphite of sodium was proposed as an agent capable of restoring the syrup, when discolored, to its normal tint. In producing this change, sodium hyposulphite, by its affinity for oxygen, passes into sodium sulphate, and in so doing parts with one-half of the sulphur it contains, thus: $Na_2S_2O_3+H_2O+I_2=Na_2SO_4+2HI+S$.

The sulphur precipitates in minute division and remains suspended in the syrup, rendering it turbid and nearly as unsightly as before the treatment with the hyposulphite.

About two years ago, I had some syrup of ferrous iodide which had changed color, and desiring to restore it to its original greenish tint, I did not feel disposed to use hyposulphite of sodium, because of the precipitate of sulphur already mentioned. In thinking upon the matter, I concluded that hypophosphorous acid, having like affinity for oxygen, would perform a similar work to that effected by the hyposulphite. I, therefore, added to a sample of my colored syrup a few drops of hypophosphorous acid (P. & W.'s), shook the bottle, and allowed it to stand a short time, and examined it, when it was found to have resumed the proper color, and the syrup was perfectly clear; I then treated the whole of the discolored syrup with hypophosphorous acid with like satisfactory results. The chemistry of these reactions will be readily understood by the following equations:

$$HPH_2O_2+I_2+H_2O=2HI+H_3PO_3, \text{ or}$$
$$HPH_2O_2+I_4+2H_2O=4HI+H_3PO_4, \text{ or}$$
$$HPH_2O_2+2Fe_2OI_4=4FeI_2+H_3PO_4.$$

There are on the table two small bottles of syrup of ferrous iodide taken from one lot; to one has been added a few drops of hypophosphorous acid, and its color is normal, the other is exhibited for comparison, showing the change of color.

If, after making syrup of ferrous iodide, it is observed that it has a slight olive tint in place of the pure pale green; this may be removed by the addition of a small quantity of solution of hypophosphorous acid, and upon introducing some clean, small nails or wire, and allowing it to stand awhile, small bubbles of gas (hydrogen) will be observed accumulating on the surface of the nails, and if the bottle is moved these will pass up through the syrup; the nails react with the hydriodic acid (formed as explained in the foregoing equations), with the liberation of hydrogen and production of ferrous iodide. Syrup thus treated is not prone to become discolored soon again.

It is not my intention to propose that hypophosphorous acid be introduced as a regular constituent of syrup of ferrous iodide, for I am opposed to tampering with officinal formulas; but I do suggest it as a remedy for the difficulty, when syrup of the iodide of iron changes color.

THE PILL SUBJECT.

BY JOSEPH P. REMINGTON.

The article, by the writer, on the "Ready-made Pills of our day," which was published in the recent Proceedings of the American Pharmaceutical Association, seems to have caused a disturbance in the ranks of the pill fraternity, more particularly, however, to some interested in the high-pressure lenticulars, who no doubt, find it up-hill work to force them upon the market, and who grow restive under criticism.

The results, as published in the paper above mentioned, having been the subject of so much misconstruction, it has been deemed best to reproduce the principal portions of the paper, in order that a clearer understanding may be had concerning it.

After the preface, the following occurs:

"Realizing the fact that a fair absolute test of solubility that would be applicable to all the varied conditions of the fluids of the stomach, whether acid, alkaline, or neutral, would be an impossibility, it was thought best to take temperature, acidity, alkalinity, and digestive power into consideration, and from this range a tolerably fair judgment might be arrived at.

"Taking, then, fair samples of the best pills that the market afforded the following experiments were made: (See page 160.)

"An examination of the results as tabulated shows that *the plain uncoated pill is to be preferred in point of solubility;* that next in order the sugar-coated pill comes; then the compressed, and lastly the gelatin-coated.

"It was thought advisable to try, along with the comparative tests, the Cachet de Pain under the same circumstances, and it will be seen that this method of coating powders and pills is superior to any in point of permitting the medicine to dissolve or digest readily."

A careful examination of these remarks in connection with the table of Relative Solubilities, which is reprinted just as it occurs in the "Proceedings," will convince most of the readers of the "Journal" who take sufficient interest in the subject, that the conclusions arrived at *were* correctly deduced from the results of the experiment; and it is the intention to pursue the inquiry further, and report at a future time.

A recent review of the article by a friend and neighbor (page 121, March number, "Am. Jour. Pharmacy") contains some inaccuracies, which may be usefully corrected.

Table of relative SOLUBILITIES OF DIFFERENT KINDS OF READY-MADE PILLS *in the market, etc., and including Cachet de Pain.*

PIL. QUINIÆ SULPH., TWO GRAINS.

Varieties.	In one fluidounce of water at 80°, Shaken every 3 minutes.	In one fluidounce of water at 98°, shaken every 3 minutes.	In one fluidounce of water slightly acidified, shaken every 3 minutes.	In one fluidounce of water at 98°, acidulated, and containing a trace of pepsin; shaken.
Plain, uncoated pill, (excipient glycerin).	Completely disintegrated in 1 hour.	Completely disintegrated in 10 minutes.	Completely disintegrated in 3 minutes.	Completely dissolved in 10 minutes.
Sugar-coated pill.	Tastes bitter in 15 minutes; disintegrated in 3 hours.	Tastes bitter in 8 minutes; in 6 hours deep ridges appeared on surface.	Sugar off in 5 minutes; disintegrated in 25 minutes.	Bitter in 3 minutes; dissolved in half an hour.
Compressed or lenticular.	But slightly affected in 30 minutes; in 1 hour not one-fourth dissolved.	Hardly affected; not dissolved in 3 hours.	Sharp edges gone in 10 minutes; in 30 minutes half gone; in 40 minutes dissolved.	Dissolved in half an hour.
Gelatin-coated.	Coating swelled partially in 1 hour; quinine not all dissolved in 18 hours.	Gelatin affected in 20 minutes; pill retains its shape for 24 hours.	Not affected in 5 minutes, nor in 30 minutes; slightly bitter in 57 minutes; gelatin swelled up in 6 hours.	Bitter in 20 minutes; disintegrated in 1 hour.
Quinine enclosed in a wafer or cachet de pain.	Quinine completely shaken out in a few moments.	Quinine completely shaken out in a few moments.	Quinine completely shaken out in a few moments.	Quinine completely shaken out in a few moments.

PIL. CATHARTIC. COMP., U. S. P.

Varieties.	In one fluidounce of water at 80°, shaken every 3 minutes.	In one fluidounce of water at 98°, shaken every 3 minutes.	In one fluidounce of water at 98°, with 10 drops diluted sulphuric acid, shaken every 3 minutes.	In one fluid ounce of water at 98°, with 10 drops liq. potassæ, shaken every 3 minutes.
Plain, uncoated pill (excipient glycerin).	Disintegrated in 1 hour.	Disintegrated in one hour.	Not disintegrated in one hour and a half.	Gone in 15 minutes.
Sugar-coated pill.	Disintegrated in one hour and a half.	Disintegrated in one hour and a half.	Water colored in 10 minutes; nearly disintegrated in 1 hour.	Disintegrated in half hour.
Compressed or lenticular.	Disintegrated in two hours.	Disintegrated in one hour and a half.	Slightly colored; not disintegrated in 1 hour.	Disintegrated in quarter of an hour.
Gelatin-coated.	Swelled enormously, but intact for 12 hours.	Gelatin swollen, but water not colored in 2 hours.	Swollen up in 2 hours; water not colored.	Not disintegrated in two hours.
Quinine enclosed in a wafer or cachet de pain.	Powder shaken out in a few moments.	Powder shaken out in a few moments.	Powder shaken out in a few moments.	Powder shaken out in a few moments.

This critic complains, firstly, that a pill made with glycerin as an excipient, is not a fair criterion of the uncoated ready-made pill of our day. In reply to this the writer would say that he has taken the trouble to inquire of a number of pharmacists as to the excipient used by them for pills which they expect to keep for a greater or lesser length of time, and he finds that the majority use glycerin, either by itself or in combination, and the reason is obvious—to keep the pill in a soft or friable condition, so as to secure ready disintegration, and the belief that this method of making a pill, represented the best kind of ready-made pill of our day, has been further confirmed.

He states, secondly, "*that he should have given the preference to the compressed pills, as it appears in his tables that they were the only ones dissolved; all the others were only disintegrated.*

This statement in point of fact is not correct, as a glance at my table will show, the word *dissolved* having been used *twice*, *not* in relation to compressed pills, but in the last column of the Pil. Quiniæ Sulph. table the word will be seen twice, connected with the plain and sugar-coated pill.

The reason the word was used at all, in alluding to the compressed quinia pill, is simply because this form of quinia pill could not possibly, under the circumstances, be forced to disintegrate. *It is a hard mass*, and it is its habit to dissolve slowly from the outside, the pill growing smaller and smaller until it finally disappears, whilst the plain and sugar-coated pills usually disintegrated quickly.

The disintegration of the pill must soon be followed by solution or digestion, if the stomach contains any fluids (as most stomachs do), and the mass of which the pill is composed is capable of being acted upon.

The next complaint is, "*In the case of the uncoated compound cathartic pill, Mr. Remington uses the indefinite and impractical expression of Gone in fifteen minutes. This implies a perfect solution of the pill, and when we take the ingredients into consideration, we know that they cannot be wholly dissolved in a weak alkaline solution.*

My friend has been led astray again. Here, the expression "Gone in 15 minutes" expresses the fact exactly. The pill, as a pill, was gone. My table has it, Plain uncoated pill, gone in 15 minutes. It had disappeared. There is no warrant whatever for his statement that "*a perfect solution of the pill was implied*," and the only object of using this admittedly odd expression was to *avoid* the incorrect one of dissolved.

But let us look for a moment at my friend's table, on page 124 of the March number (before quoted). It is headed, Comparative table, showing the time required for *dissolving*[1] the different makes of pills, as enumerated, *in water*, *at* 100°[1] Fahrenheit, and in a solution corresponding to the gastric juice, at 100° Fahrenheit.

Under it, by casting the eye down the first column, we see, not only the compound cathartic pill *dissolved* in *plain warm water*, without the use of even weak alkali, but rhubarb, compound rhubarb, and, worse than either, aloes and mastiche; and this error is repeated in many places, in these and in other cases throughout his table.

How was the *solution* of the rhubarb, mastiche, calomel, etc., etc., in plain water accomplished?

A curious error *in this connection* occurs again in my critic's table, on page 124. The second pill on the list is called Pil. Quiniæ bisulph., 2 gr., and it is under the column *officinal.* (?) The time taken to dissolve this pill is set down as 45 minutes, in water, temp. 100°.

He himself defines a regular officinal ready-made pill of the shop as one usually made in strict accordance with the ingredients and excipients directed in the United States "Pharmacopœia." See page 121 (12th line in article).

Now, in what edition of our national authority does he find *this pill* officinal? and how could *he* use officinal ingredients and excipients for it, when such a pill does *not* exist in our "Pharmacopœia"?

The next attempted criticism is in relation to the shaking every three minutes in the case of the gelatin coated pill. It will be observed that the time referred to here (18 hours) is in the first case connected with a distinct sentence, for it says, Quinine not all dissolved in 18 hours, and in the second case, Pill retains its shape for 24 hours.

It may be said, also, that as this was a comparative test, as soon as the position of the pill was determined in the race the point was settled, and although the time occupied in making the experiments did extend far into the night, the terms 18 and 24 hours do not fully express the *full* time that it did take to disintegrate the pills in their respective liquids, the actual time being much longer, but are added as explanatory notes.

The next point as to how temperature can be maintained is not worthy of consideration, and was not stated in the paper because the writer believed that *every member* of the American Pharmaceutical Association knew how to manage such a simple thing as this.

[1] Italics, mine.

My critic's next subject of attack—the object of the representation of the cut of the pill machine for making the third-rate pill—is best answered by quoting from the original paper *the statement*, which is (referring to the compressed pill), that

"The powerful pressure, often brought to bear to cause the dry materials to cohere, often operates unfavorably in this variety of pill, except in a few instances where the ingredient is readily soluble, as bisulphate quinia, bromide or iodide of potassium, etc., etc.

"It may not be known that this variety can be made readily by the pharmacist himself, if he so desires, by having a mechanic make a simple piece of apparatus.

"Take a solid cylinder of iron," etc., etc.,

and then follows a description of how to make a pill-press.

How my friend can construe the above, so as to cause him to make the statement, "That Mr. Remington really intended to endorse the compressed pills as superior to all other ready-made pills of our day," is a mystery.

My friend objects to the opinion advanced that the pressure used in making a compressed pill interferes with its solubility, and puts forward a microscopical examination to prove his position, and he finds that under the microscope they are *quite porous.* What does "quite porous" mean, were the pores measured by a micrometer? Did he try the plain, sugar-coated or gelatin-coated pill, under the same power, for relative porosity, and, if so, why were the results not given. The fact is that pores are very plainly visible (*without* the use of the microscope), when either the plain, sugar-coated or gelatin-coated pills are broken open, as any one may prove easily.

The last point which my neighbor finds fault with is the simple process of shaking, employed by the writer.

It was not pretended that the pills were subjected to exactly this method of treatment when in the stomach, but it was believed that if "fair samples of the *best* pills that the market afforded" were placed in various liquids, and all agitated in a similar manner, that a tolerably fair *comparative* test would be afforded. Yet, how inconsistent is my friend. He objects to agitation, and yet attaches four bottles, loaded with quinia pills and water, to the eccentric rod of an upright steam-engine, speeded up to 350 revolutions a minute, and of course it ends in bringing out his favorite so-called patent pill ahead of all others; but does he not entirely stultify his results by his next few sentences, when he says "the digestive process of the stomach is not agitation, but more properly a churning or circulatory displacement process, quiet but continuous in its mode of operation"? Would it not follow most naturally that if these were his conscientious views on the subject of digestive or peristaltic action, that, instead of the eccentric rod of an upright steam-engine, speeded up to 350 revolutions a minute, the proper apparatus would have been an old-fashioned *churn* revolving once, say, in ·350 minutes, quiet and continuous in its mode of operation, or —— a circulatory displacer?

CACHETS DE PAIN.

BY ANDREW BLAIR, PH.G.

I have read the article in the March "Journal" headed "Cachets de Pain," by H. P. Lechler, Ph.G., and extend my sympathy to him in his unfortunate experience with the article. He has described correctly the manner of preparing these wafers, but his manipulations have not been successful; still he should not on this account condemn the whole arrangement, when hundreds of others will testify to their success in preparing them and the great satisfaction given both to physicians and patients by the use of them. I desire to add a word on the subject which my friend "hopes will be referred to as a thing of the past." I do not intend or wish to argue that these wafers will be or ever were intended as a substitute on "all" occasions for the usual pills or powders; but there are cases, not unfrequent, where the physician wishes to give a nauseous or bitter dose, the taste of which he would like to disguise. In such cases these wafers answer the purpose admirably. I will refer to the different points mentioned by Mr. Lechler, who I feel has not been correctly informed as to the proper way of preparing and giving directions for taking these wafers, hoping it may enable those who have had like experience with him to dispense the article with more satisfaction to themselves and their customers.

Mr. Lechler declares that it takes at least five times as long to prepare twelve cachets as to prepare the same number of powders or pills. Our experience has been very different. We have prepared thousands of them since they were first introduced, and the time required has been very little if any more than for folding the same number of powders. The complaint that the discs adhere to the press, indicates that the dies are not clean, or have become wet by the excess of moisture spoken of by Mr. Lechler. All kinds of apparatus and machinery, ever so complete and perfect in their different parts, require more or less skill and judgment on the part of the operator. Sealing corks with a metal stamp and sealing-wax is a very simple operation, and makes a beautiful, smooth impression, when properly done; but by continued use the stamp gets warm, and the wax begins to stick to it; now, if the operator persists in trying to make a good impression, he will fail every time till he cleans and cools the stamp. So, also, in using the wafer machine. Careful drying after they are removed from the press is not necessary if properly prepared. I have seen quinine

wafers prepared by the hundred and thrown into a large bottle immediately as they were taken from the press, without adhering to each other in any instance. There is no occasion at any time to have an excess of moisture on the rim of the wafers if the proper appliances are used. There is to be had what is called a "Cachet Machine," which has among its several parts a "Wetter," suited to each of the three sizes of wafers; also, a "Wetting Pad," by the use of which just the proper quantity of moisture is applied, and in just the proper place around the rim of the wafer. If my friend has used a brush to accomplish this (as I have known some to do), I can easily account for the excess of moisture he speaks of.

The tendency to cause a rupture, as referred to, is very rare, if "a little" care is used in handling them, and it is taken into consideration that a slight pressure of the hand on the press is all that is needed to secure the edges of the discs to each other. In regard to the directions for the patient—"to simply dip the wafer in water, then with the fingers put it on the tongue, and swallow with a draught of water," is not correct, and will occasion many failures in attaining the object for which they are intended. The mere dipping in water is not sufficient to make them soft and pliable; and if they are held long enough to accomplish this, they become so glutinous that the least pressuse of the finger would cause a rupture.

The proper directions are: Place a wafer in a spoonful of water, let remain a few seconds, till soft, then swallow altogether. "If necessary," it might be well to add "the patient need not swallow the spoon." In regard to the physicians not giving the proper directions for taking them, this can, and should be remedied by every intelligent apothecary, namely, have the above directions printed on a small label, and placed on the box, in addition to the usual ℞ label. Given according to these directions, Cachets become soft and pliable, accommodate themselves to the shape of the throat and afford no discomfort or inconvenience to the patient. A child can take the large size without trouble.

Any one, physician or patient, seeing a new thing, for the first time, without any explanation, in many cases will be perfectly ignorant of its use or mode of operation, and, for want of a proper explanation, it may fall into disrepute. This, no doubt, has often been the case with Cachets.

I heard an intelligent physician, when shown these wafers the first time, remark, "Why, you don't expect any one to swallow those big buttons, those rough edges would scratch a man's throat," but when it was explained how they were used, and he had actually swallowed one, he changed his tune and left the store with the remark, "They are excellent for the purpose they are intended."

The claim of the inventor of Cachets, that, by their use, two separate salts can be introduced into the stomach, and there form another salt, is verily true. The combinations made use of by Mr. Lechler have enabled him to show (in these instances only), the absurdity of the claim. I do not know if any of his friends in the medical profession are in the habit of directing a Seidlitz powder to be taken thus, the white powder to be taken first, and the blue one immediately after, in order to have the tartrate of soda in a nascent state in the stomach. I do not recollect any instance where a physician has desired to prescribe mixtures that would produce such evolution of carbonic acid in the stomach as those mentioned by Mr. Lechler, and, therefore, do not consider it a fair test. There are many instances where the claim can, and has been, successfully brought into use.

I have written these lines solely with a desire to show the friends in pharmacy that there are some good qualities in these wafers, and that they answer an excellent purpose in many cases.

PRACTICAL NOTES.

BY GUSTAVE C. RACHER.

Medicated Waters.—As medicated waters are very apt to spoil, I conceived, two years ago, the idea of substituting glycerin for magnesia. I was successful with the experiment so far, and therefore lay it before the profession for consideration. The formula is the following:

Volatile oil,	℥ss
Glycerin (pure),	℥ii
Mix by succussion, add	
Distilled water,	℥ii

Mix and transfer to a filter, adding through it the requisite quantity of water.

Adulteration of Balsam of Peru.—A simple test, by which even a small addition of castor oil to the balsam may be detected, is the following:

Put ten drops of suspected balsam in a mortar, and rub it quickly with half a fluidrachm of sulphuric acid for one minute; add then half a fluidounce of water, keeping rubbing briskly for two minutes longer. Take the resulting black mass out, put it on a piece of filtering-paper, in order to detach the adhering diluted sulphuric acid. When the balsam is pure, it will give a quickly-hardening black, after an hour, brittle mass; but when the balsam is mixed with castor oil, the resulting mass will stay tenacious, stick to the fingers, and resemble soft, black pitch.

Carrollton, La., February, 1876.

THE DIVISION OF POISONS.

BY WALTER E. BIBBY, PH. G.

(*Read at the Pharmaceutical Meeting, March 21st.*)

As a large number of the medicines prescribed by physicians of the present day are very poisonous, it devolves upon the pharmacist to exercise the greatest care and caution in compounding prescriptions containing such poisonous substances as strychnia, hydrarg. chlor. cor., arsenious acid, narcotic extracts, etc. It often occurs that physicians prescribe these remedies in minute doses for children, aged persons and delicate females; it is, therefore, exceedingly important that they should not receive a fraction over the quantity prescribed.

The greatest care and attention should be given to this class of prescriptions, so that, when a third is prescribed, a half grain may not be given, which, in all probability, would result very seriously, or produce a condition of affairs entirely different from that anticipated by the physician; moreover, the uncertainty attending the weighing of fractions of grains by ordinary scales, renders it necessary for the pharmacist to first weigh one grain and then divide this into the quantity prescribed, in other words, virtually guess at the quantity.

To remedy this, and at the same time, secure to physicians and pharmacists absolute certainty, I would recommend that trituration of the poisons in common use be made of such a strength that each grain of the trituration shall represent a certain quantity of the poison, and the trituration be made only with sugar of milk. The reasons for using this substance are various. In the first place, sugar of milk is a harmless, hard, gritty, odorless and almost tasteless substance. It is

less liable to attract moisture from the atmosphere than any other substance; in fact, it posesses all the qualities desired for making a perfect trituration. The proportion I would suggest are one grain of the poisonous substance to seven grains of sugar of milk, making in all, eight grains,—the whole to be thoroughly triturated. The process of trituration is too well known to pharmacists to require elucidation in this article, and they are also well aware how important it is to carry out this process in an exact and careful manner.

Now, when a physician writes for a quarter of a grain of arsenious acid, all that is necessary is to weigh two grains of the trituration, and you have the quarter of a grain desired. This method I hold to be the safest in weighing poisons—a method by which very small fractions of grains may be obtained,—and where children, the aged or very delicate are interested, to be one of precision. The physician can also prescribe with a feeling of certainty when using those poisonous substances in this trituration, and he may have the assurance that, when he prescribes the one quarter of a grain, he obtains that amount,—for the reason, that two grains of any substance will turn the beam of an ordinary scale more readily than a quarter of a grain. I have seen scales in some of our first-class stores on which the half of a grain could not be weighed with any degree of certainty, but on which two or four grains could be weighed with accuracy.

Likewise, the pharmacist can be more expeditious in dispensing his order, thereby rendering the sick a prompt, safe and reliable prescription, and one exactly in accordance with the physician's wants.

REMARKS ON IRON SALTS IN THE FORM OF SCALES.

BY G. H. CHAS. KLIE.

These preparations are all obtained by spreading the thick, syrupy liquid of the several salts on glass or marble, and letting it dry in the open air, or, which is preferable on account of being more expeditious, in a drying chamber. They are handsome and elegant in appearance, and their successful preparation gives great satisfaction to the preparer. In the following, I desire to give some of my observations regarding these preparations, noted down while making them.

The "U. S. Pharmacopœia" gives formulæ for the preparation of seven. They are: Ferri citras, ferri et ammonii citras, ferri et am-

monii tartras, ferri et potassii tartras, ferri et quiniæ citras, ferri et strychniæ citras and ferri pyrophosphas. There are others, obtained in the same form as these, but not officinal. I propose to confine my remarks to the above-mentioned, exclusively.

Except pyrophosphate of iron, they all have oxide of iron for base. This is made from the solution of tersulphate of iron, by precipitating with water of ammonia. To obtain a perfect oxide of iron free from discoloration, a solution of tersulphate of iron is used, in which all sulphate of iron is perfectly oxidized. In preparing the solution, this is ascertained by taking a small quantity, diluting with water, and adding water of ammonia in excess. If a clear, reddish-brown precipitate results, oxidation is complete, but, if it is discolored, brownish-black, with dirty gray, nitric acid is added to the hot solution, drop by drop, until the disengagement of nitrous acid gas ceases, when the oxidation will be found to be complete, and the precipitate obtained without discoloration. The precipitated oxide of iron is washed until the washings pass nearly tasteless, or if wanted perfectly pure, first wash with water, and finally with distilled water, until the washings cease to produce a precipitate with chloride of barium.

The magma of oxide of iron is dissolved in citric acid at a temperature not exceeding 140° F., and evaporated at the same temperature, to form citrate of iron. This salt dissolves with difficulty in cold, but more readily in warm water.

Ammonio-citrate of iron is prepared by adding a sufficient quantity of water of ammonia to neutralize the acid solution of citrate of iron. This neutralization renders an otherwise difficultly soluble salt readily soluble in cold water.

In tartrate of iron and ammonium, oxide of iron is dissolved in a neutralized solution of bitartrate of ammonium. The "Pharmacopœia" says, "slowly soluble," which is so, it being rather slowly soluble.

Tartrate of iron and potassium is made by dissolving oxide of iron in the free tartaric acid of bitartrate of potassium or cream of tartar. The "Pharmacopœia" says, "wholly soluble in water." I find it, prepared strictly according to the formula, slowly soluble in cold water, the solution depositing a copious precipitate.

Citrate of iron and quinia is prepared by dissolving a certain quantity of quinia in solution of citrate of iron. The "Pharmacopœia" says of the salt, "slowly soluble in cold water," which is in truth so; in fact, it is too slowly soluble.

In citrate of iron and strychnia, strychnia is dissolved in a solution of citrate of iron and ammonium. The dry salt is readily soluble in cold water.

For pyrophosphate of iron, instead of water of ammonia a solution of pyrophosphate of soda is used as precipitant. The precipitated pyrophosphate of iron is thoroughly washed, for if any considerable quantity of sulphate of sodium should remain, it will, when the salt is dried, effloresce and destroy its characteristic appearance. The magma of pyrophosphate of iron is dissolved in a neutral solution of citrate of ammonium. Although the "Pharmacopœia" says, "it is wholly and freely soluble in water," I find it, in reality, very slowly soluble in cold water.

I have often made these several preparations, and those that dissolve readily in cold water always gave entire satisfaction; but the tartrate of iron and ammonium, tartrate of iron and potassium, citrate of iron and quinia and pyrophosphate of iron, although made strictly according to the formulæ of the "Pharmacopœia," and were unexceptional in appearance, still their solubility, when compared with that of the same preparations purchased from the wholesale manufacturing chemist, was invariably found inferior. This proved very discouraging, and for a long time I could not find out how to remedy the defect. All the certainty I gained was, that the wholesale manufacturing chemist had a method of making these preparations readily soluble in cold water, of which the "Pharmacopœia" mentioned nothing. All at once the thought occurred to me: If citrate of iron, so difficult of solution in cold water, is, by the addition of water of ammonium, rendered readily soluble, why should not the other salts, having the same defect, be rendered just as soluble by the same addition? I followed up the idea, and found it entirely successful. The water of ammonia is invariably added after final filtration, before evaporating to a syrupy consistence. Care must be taken, however, not to add too much, especially to citrate of iron and quinia. If too much is added to this preparation the quinia will be precipitated, although it may be redissolved by the gradual addition of small quantities of citric acid. If the solutions of the different salts are tested before evaporation, before making the addition of water of ammonia, they will be found to react decidedly acid, and it seems this free acid occasions the difficult solubility of the dry salt.

If the quantities in the formula for tartrate of iron and potassium of

the "Pharmacopœia" are taken as given, it will require about 3 fl. ozs. of water of ammonia for neutralization of the free acid, and rendering the salt soluble, the product weighing about 8 ozs. avoi. It requires about the same quantity for the others, but litmus paper is the surest and best test.

N. St. Louis, Mo., March 19th, 1876.

THE INVERSE SYNTHESIS OF THE SO-CALLED TASTELESS IRON COMPOUNDS.

BY R. ROTHER.

The theory that a ferric salt, as, for instance, the chloride, should directly combine, upon the principle of salification, with a normal monad salt of a polybasic vegetable acid, conflicts with all chemical laws, and neither the old dualistic hypothesis or the new typal theory can embrace or comprehend it. It is equally a failure on the plan of the compound salts, since double, triple and quadruple salts, properly so called, are respectively derived from dibasic, tribasic and tetrabasic acids when each unit of equivalency is separately saturated by a distinct basilous radical. It is likewise inadmissible of classification with another category of compound salts, the reverse of the preceding, which the writer denominates secondary, tertiary and quarternary, according to the atomicity of the basic radical, whose independent units of equivalency are separately saturated by corresponding acid radicals.

By the laws of chemical affinity, ferric chloride in aqueous contact with normal potassium citrate, can no longer exist as such, because the ferric molecule, feebly replacing the basic hydrogen of the chlorhydric acid, finds itself superseded by a more perfect base, whose affinity is greater for the stronger chlorous than citric radical. Therefore potassium chloride and ferric citrate must result. A mixture of ferric chloride and tripotassic citrate in certain proportions becomes green, and it was found that twice the equivalent amount of monad citrate was required to produce that result. Nothing was, however, mentioned of the intermediate change, and the belief was permitted to prevail that the final green is the only color that appears. The writer has, however, noticed that the pale yellow ferric chloride solution assumes, in contact with the citrate, a preliminary red, which, by continued addition of the citrate, gradually and completely changes into green. Owing to the rather strong character of the citric radical and its tendency

to form double salts, the latter property is exerted before entire double decomposition is effected; hence, in order to insure this completely, sufficient monad citrate must be present to form double salt with the ferric citrate to be produced. This is very clearly seen from the following equation:

$$Fe_2Cl_6+4(K_3C_6H_5O_7)=6(KCl)+2(FeC_6H_5O_7.K_3C_6H_5O_7).$$

On evaporating the solution containing the mixture represented by the second member of this equation, a greenish-white granular mass is obtained. Since potassium chloride is not sufficiently soluble in alcohol to effect a separation, the writer proposed to eliminate it by means of dialysis. A capacious parchment filter, containing the concentrated solution, was suspended in pure water, and after a few moments a strong exosmotic current of heavy liquid was seen descending from the apex of the cone. After about six hours, the powerful endosmotic current had nearly filled the dialyser which at first was scarcely one-third full. The diffusate had assumed a yellowish tint, showing that a trace of iron had also passed; but on concentration the potassium chloride began to crystallize abundantly, and on evaporation to dryness a crystalline residue of potassium chloride was obtained, corresponding to over $\frac{3}{4}$ of the theoretical yield. Having found the parchment filter too inconvenient, the writer again concentrated the liquid in the dialyser, placed it into a capacious wide-mouthed bottle, then tied over the mouth with pig's bladder previously washed in very dilute ammonia, and inverted the bottle into a vessel containing pure water. The dialysis now proceeded more satisfactorily, since the endosmotic current was nearly overcome by the tension of the atmosphere within the bottle. A slight increase of the volume of the diffusum was, however, noticed, and the consequent compression of the enclosed air distended the membrane considerably.

The dialysis was discontinued after about 48 hours, having in the mean time changed the diffusate frequently. The colloidal remnant of the diffusum was then tested for chlorine with argentic nitrate, after strong acidulation with nitric acid, when only an opalescence appeared, showing that complete removal of the potassium chloride had taken place, whilst the green color of the residual liquid remained unchanged.

The iodide was then subjected to dialysis. As the writer had already separated the potassium iodide by means of alcohol, a trial with dialysis seemed really superfluous; but, as it had been intimated that free

iodine made its appearance in the diffusate, the writer undertook the experiment. The compound was prepared, but it was observed that, owing to the carbonaceous character of the iron filings, a small quantity of iodine had been converted into iodhydric acid, which caused effervescence long after the iodine color had disappeared. By now adding the remaining third of the iodine, a liquid resulted which, by reason of part of its iodine being united to hydrogen, instead of iron yielded a mixture of ferrous iodide, free iodine and iodhydric acid, containing less iron than is required to form Fe_2I_6, by an amount equivalent to the iodhydric acid that was formed. On now treating this solution with potassium nitrate, that part of the iodine only was converted into potassium iodide which corresponded to Fe_2I_6, the rest remaining free. Hence, if such a solution is dialysed, free iodine must necessarily appear in the diffusate. Before dialysing this liquid the writer concentrated it by evaporation, and thus got rid of the free iodine. The solution, on being treated like that of the chloride, yielded, after a dialysis of four hours, a diffusate faintly yellow from a trace of iron, but containing no free iodine. This liquid, on evaporation, gave a white crystalline residue of potassium iodide, representing nearly $\frac{1}{4}$ of the iodine originally used. The second diffusate rendered up the remaining complement.

The officinal ferric pyrophosphate was next tried, but, although a yellowish diffusate appeared, no decided amount of residue was obtained; accordingly it must be inferred that no crystalloid is present, and therefore dialysis cannot effect a separation.

The ammonio-citroferric orthophosphate was then prepared ("Pharmacist," August, 1871), and a concentrated solution precipitated by alcohol. The filtrate contained a trace of iron, and on evaporation yielded quite an appreciable syrupy residue, which, on the addition of ammonia in excess, congealed to a crystalline mass of triammonic phosphate. Dialysis of another portion of the concentrated solution gave a yellow diffusate, from which a small amount of saline residue was obtained. This result also points to a colloidal condition of the mixed compounds.

The writer in his paper on Ferric Iodide ("Laboratory," February, 1876) proposed to show that the officinal ferric pyrophosphate could be more conveniently and economically prepared by mixing certain proportions of ferric citrate and ammonium pyrophosphate. On the

same plan, it was also proposed to construct the orthophosphate by mixing ferric citrate with triammonic phosphate. Trial showed that mixtures of these two kinds resulted in products having the appearance of the preparations made by the usual methods. It was, however, ascertained that the precise imitation by inverse synthesis, was impossible, since, in each of these two cases, by the usual methods, an excess of the ferric phosphates was absorbed.

By an inspection of the officinal formula for ferric pyrophosphate, it was discovered that ferric pyrophosphate and triammonic citrate react upon each other in the proportion of one equivalent of ferric pyrophosphate to three equivalents of triammonic citrate, producing ammonio-ferric pyrophosphate, ammonio-ferric citrate and free ferric citrate, thus : $2(Fe_43P_2O_7)+6(NH_4)_3C_6H_5O_7)=Fe_43P_2O_7.3(NH_4)_4P_2O_7)+2(FeC_6H_5O_7.(NH_4)_3C_6H_5O_7)+2(FeC_6H_5O_7.)$

This shows that the officinal salt is a rather complex compound, and that the presence of uncombined ferric citrate is the cause of the peculiar tint described as apple green. It also explains why dialysis can not separate the mixture, as all three of the constituents are uncrystallizable, and, therefore, colloidal. The nearest approach to this compound, by means of inverse synthesis, is four equivalents of ferric citrate and three of ammonium pyrophosphate, which produces only ammonio-ferric pyrophosphate and ammonio-ferric citrate, thus : $8(FeC_6H_5O_7)+6((NH_4)_4P_2O_7)=Fe_43P_3O_7.3((NH_4)_4P_2O_7)+4(FeC_6H_5O_7.(NH_4)_3C_6H_5O_7.)$

This is also equal to $2(Fe_43P_2O_7)+8((NH_4)_3C_6H_5O_7)$, that is one equivalent of ferric pyrophosphate and four equivalents of triammonic citrate, and differs from the officinal by one equivalent of triammonic citrate in excess.

Otherwise, the difference in the two compounds may also be shown as follows : $4(Fe_43P_2O_7)+12((NH_4)_3C_6H_5O_7)=Fe_43P_2O_7+3(4(FeC_6H_5O_7)+3((NH_4)_4P_2O_7.)$

This indicates that the officinal salt is equal to one equivalent of ferric pyrophosphate and three of the imitation salt.

The salt, or rather mixture produced by retrograde decomposition, has the bright green color peculiar to ammonio-ferric citrate, but addition of a certain proportion of ferric citrate generates the apple green tint. By mixing two equivalents of ferric citrate and one of ammonium pyrophosphate a mixture exactly analogous to the officinal salt is

obtained, containing a like quantity of ammonio-ferric pyrophosphate mixed with twice as much ammonio-ferric citrate and free ferric citrate as the officinal salt contains.

The writer thinks that in the next revision of the Pharmacopœia the now officinal ammonio-pyrophosphate should be dropped and replaced by a sodium salt represented by two equivalents of ferric citrate and one of sodium pyrophosphate thus:

$$2(FeC_6H_5O_7)+Na_4P_2O_7.$$

Inverse synthesis can not exactly produce the ammonio-citroferric orthophosphate as no mixture of ferric citrate and triammonic phosphate can approach any nearer than equal equivalents of each. The writer, however, believes that also in this case a sodium compound is better. Ferric citrate and disodic phosphate will produce perfectly green compounds in proportions that do not exceed 4 equivalents of the former to one of the latter.

Ferric orthophosphate reacts upon triammonic citrate in the proportion of two equivalents of the first and one of the second, producing a solution which is brown-red by transmitted and green by reflected light. Addition of citric acid, monammonic or diammonic citrate to this solution discharges the red color mostly, and forms a solution which is also green by transmitted light. By evaporating the red solution to a syrupy consistence and spreading it on plates of glass or porcelain beautiful brownish green scales are easily obtained. Similar treatment of the acidulated solution as readily yields greenish scales which cannot be distinguished by appearance from the officinal pyrophosphate. The reddish brown color of this compound points to a basic condition due to the presence of free ferric hydrate, hence its formation may be written thus:

$$4(FePO_4)+2(NH_4)_3C_6H_5O_7+3(OH_2)=FeC_6H_5O_7.(NH_4)_3C_6H_5O_7+2(FePO_4).(NH_4)_3H_3(PO_4)_2+Fe(OH)_3.$$

This result assumes the generation of an ammonio-ferric orthophosphate in which one equivalent each monammonic and diammonic phosphate unite to form a neutral phosphate as follows:

$$(NH_4)_2HPO_4+NH_4H_2PO_4=(NH_4)_3H_3(PO_4)_2.$$

In such a mixture the writer attempted to dissolve freshly precipitated ferric orthophosphate, but failed, no solution taking place. However a trial with ferric citrate succeeded perfectly, and a new salt of a brown-green color was obtained. Equal equivalents of ferric citrate

and ferric phosphate unite to produce a soluble compound, the solution of which, when evaporated and scaled, yields a beautiful secondary salt, having the formula: $Fe_2(C_6H_5O_7)(PO_4)$.

This ferric citrophosphate is undoubtedly superior in various respects to the complex mixtures obtained from the ferric phosphates by the use of monad citrates. This salt is entirely ferruginous, and must therefore rank medicinally with the normal or primary ferric salts in which only one acid radical is combined. Its formation is also remarkable, in that it cannot be produced by treating ferric phosphate with citric acid, no combination taking place. If however ferric citrate is treated with a certain proportion of orthophosphoric acid a green liquid results, but if an excess of phosphoric acid is added all the iron is precipitated as ferric phosphate, which the liberated citric acid fails to retain in solution.

A convenient method of preparing ferric citrophosphate will be to treat a concentrated solution of ferric sulphate with an amount of disodic orthophosphate sufficient to convert half the iron into phosphate and then adding disodic carbonate in excess, washing the mixed phosphate and oxy-carbonate by decantation and dissolving it in an amount of citric acid sufficient to convert the ferric oxy-carbonate into ferric citrate.

Ferric chloride, sulphate, iodide, etc., remain unchanged in presence of ferric citrate, for the reason, that radicals of the same basicity can only form compound salts of this order; hence, only ferric salts of tribasic acids can directly unite with ferric citrate.

As a general rule all the amorphous ferric salts, or mixtures of them with other amorphous salts, can be obtained in transparent scales, but a mixture of an amorphous ferric salt with some other crystallizable salt, will invariably produce an opaque granular mass iususceptible of crystallizing or scaling. Therefore, if the result of a reaction between a ferric and some other salt, yields on drying, a granular mass; a crystalline constituent can positively be inferred, but if such a decomposition results in a transparent, scaly compound, the absence of crystalline bodies is unfailingly pointed out.

All the green compound ferric citrates when treated with alkalies in excess, become brown or red, and all such compounds which have been either reddened by alkalies or obtain this color as the result of the reaction which produced them, will become green after the addition of

citric acid or an acid monad citrate. Mixtures of ferric chloride, sulphate, iodide, citrate, etc., with sufficient monad citrate acquire a uniform green color. The officinal ferric pyrophosphate has a green color of a different shade, due to an excess of ferric citrate; addition of triammonic citrate changes it to the green of the other mixtures. Ammonio-citroferric orthophosphate is green only by reflected light and red (derived from the presence of free ferric hydrate,) by transmitted; addition of either di- or monammonic citrate causes a change to the green of the other mixtures.

If ferrous salts have a marked affinity for nitrogen dioxide, much more have the ferric salts for nitrogen trioxide and tetroxide. Ferric salts retain these gases so firmly that prolonged boiling of their solutions fails to expel them, and even the dried compounds must be maintained at a comparatively high temperature for a considerable time before complete separation is effected. In consideration of this fact the use of potassium chlorate in place of nitric acid is greatly preferable. Furthermore, the writer has ascertained the important fact ("Pharmacist," October, 1872,) that there is a chemical difference between ferric salts produced by nitric acid, and those generated by means of potassium chlorate.

From the chemical and physical differences of the ammonio-ferric sulphates, obtained from the two modifications of ferric sulphate, the writer infers that through the action of nitric acid, probably aided by heat, the constitution of the ferric molecule itself is altered. For this reason the writer proposes to designate the normal condition of molecule as orthoferric, and that in the modified state as metaferric. All the orthoferric salts are distinguished by their lighter colors. Ammonio-orthoferric sulphate is beautifully yellow and of greater stability than the ammonio-metaferric sulphate, which has a violet color. Formerly, tincture of ferric chloride was prepared from a ferric hydrate, obtained by exposing ferrous carbonate to the air until the conversion was effected. The reputation of tincture of ferric chloride was built upon this preparation, which had not sustained the action of nitric acid or heat. Neither did this tincture possess the etherial odor which characterizes the new officinal tincture, in which the presence of nitrogen oxides generates ethyl nitrite, upon which this odor depends. Tincture of ferric chloride, recently prepared and treated with potassium citrate so as to form the so-called tasteless tincture, will also

acquire the etherial odor, for the reason that the nitrogen oxides are unaffected by this addition, and perfectly free to react upon the alcohol.

Tincture of ferric chloride, prepared with potasium chlorate, does not attain the etheral fragrance, and if ethyl chloride, also called hydrochloric ether, is generated, its by no means pleasant odor would certainly become perceptible. This tincture, however, has a pure, spirituous odor, and is otherwise analogous to the older tincture which represented an orthoferric salt.

MINUTES OF THE PHARMACEUTICAL MEETING.

The fifth regular meeting of the session was held March 21st, 1876, Dillwyn Parrish in the chair. The minutes of the previous meeting were read and approved.

Prof. Maisch donated to the cabinet a cone from the *Pinus pinea*, of Southern Europe, being the same species which yields the pine-nuts exhibited at a former meeting.

Henry Trimble exhibited an unknown substance, which had been sent from Maryland to this city, to be sold for powdered ergot. It has no resemblance to that drug.

Prof. Remington read a paper on a singular reaction occurring in a medicine composed of syrups of wild-cherry and squill, spirit of nitre, tincture of lobelia and sulphate of morphia, which turned green on standing, as was stated in a letter received from J. W. Hall, of Nashville, Tenn. The color reaction did not take place immediately, but after some hours, and appears to be due to the presence of traces of iron in spirit of nitre and acetic acid, from which the syrup of squill had been made. The conclusion arrived at by the experimenter was, that extreme nicety should be observed in the apparatus for handling such liquids. Prof. Remington proposes to continue his experiments, and report at the next meeting.

Dr. Pile had frequently observed cases in which a variation in the order of mixing the ingredients would determine different colored solutions.

J. T. Shinn had been surprised to find, upon attempting to prepare a prescription containing sulphate of iron, sulphate of magnesium and chloride of sodium, a precipitation of a red iron compound would take place, and nothing but the addition of sulphuric acid would prevent it.

Dr. Pile had recently seen a prescription for Pulvis Membranæ Galli; the opinion was held that it was a mystification symbolic of pepsin.

J. C. Biddle submitted samples of powdered squill, the usual caking of which is prevented by the use of sugar of milk in the proportion of 1 part to 3 of the squill. The first sample had bee prepared 18 months ago, and had received such care only as is customary with a dispensing bottle. The other had been exposed to the air on a paper for one month, without having lost its pulverulent condition. The use of sugar of milk for this purpose had been suggested to him by W. F. Bender, Apothecary to the Philadelphia Hospital.

W. H. Mattern exhibited a suppository mould made of plaster-of-paris and suppositories made in it, and stated that it worked satisfactorily. The mould was made in a manner similar to that proposed on page 5 of "Am. Journ. Pharm. 1873."

Dr. Miller read a paper, by Walter E. Bibby, entitled, "The Division of Poisons." (See page 167.)

Prof. Maisch approved of the suggestion, and said the method is recognized in the Pharmacopœia Germanica, for preparing powdered narcotic extracts, and in stores where much dispensing is done, it is customary to keep many poisonous articles, triturated to a uniform powder with milksugar, and many salts in solution of a definite strength.

J. T. Shinn desired to know the experience of the members in preserving solutions for hypodermic use. Prof. Remington had tried many of the methods that had been recommended, but still met with difficulties, and, as these solutions are, from the nature of circumstances, at times, liable to cause irritation, had abandoned the idea of keeping a stock ready made. Prof. Maisch called attention to the remarks of Prof. C Johnson, of Baltimore, in "Am. Journ. Pharm.," 1873, p. 200, suggesting the use of sulphurous acid.

Compressed pills being spoken of, Prof. Remington said the paper prepared by him, and read before the American Pharmaceutical Association, at Boston, was made public two weeks before Mr. Dunton had procured his patent, and that his second paper was published before that gentleman procured his second patent. J. T. Shinn reminded the members that compressed pills were no new thing, he having seen some made more than 20 years ago.

Prof. Maisch desired to have, if possible, our meetings continued over the coming summer.

The thanks of the meeting were voted to the donors and exhibitors. On motion, adjourned to meet on April 18th, 1876, at 3½ P. M.

WILLIAM MCINTYRE, *Registrar.*

PHARMACEUTICAL COLLEGES AND ASSOCIATIONS.

PHILADELPHIA COLLEGE OF PHARMACY.—On Monday, February 28th, the fifty-fifth course of lectures was closed, and the examinations commenced on the following day, lasting until Friday, March 4th, one set of the following questions being given to the candidates on each day, the written answers being required within five hours:

QUESTIONS IN CHEMISTRY.

1. What is Chlorine? Give a method by which it may be obtained, state its properties and mention the officinal articles of the U. S. and Br. Pharmacopœias, in forming of which gaseous Chlorine is used.

2. What compounds of Lead are officinal? State the mode of preparation of each and give a formula (in symbols) of the reaction of any one of them.

3. What are the present chemical and officinal names of the Carbonates of Sodium? Give and explain the methods by which they are produced, and state the characteristic properties of each and tests of their purity.

4. What are the officinal names (U. S. and Br. P.) of Muriatic Acid? Give and explain the method by which it is produced, the forms in which it is used in medicine and pharmacy and any impurities found in the acid of commerce.

5. What compounds of Silver are officinal? Give their mode of preparation, their properties and adulterations.

6. What Tartrates are officinal? Give the mode of preparation common to nearly all, and any special cautions and reasons therefor required in some.

7. How is Corrosive Sublimate prepared? Explain the process, give its composition, properties and officinal names.

8. By what tests may the salts of Magnesium, Zinc and Cadmium be distinguished from each other?

9. What are the Antidotes for the Mineral Acids, and how do they act?

10. Under what circumstances is Water liable to become contaminated with Lead? State what salts, often present in river water, will prevent this contamination.

QUESTIONS IN MATERIA MEDICA AND BOTANY.

1. Describe briefly the development of the Axis of Plants, and how its growth differs from that of the leaves.

2. Give the name, natural order and habitat of the plant yielding the officinal Rhatany Root. What are the physical characteristics, chemical constituents and medicinal properties of the drug, and how may it be distinguished from the roots of other species of the same genus?

3. Name the plants, with their natural order, yielding the European and the American Veratrum; describe the growth, structure and dose of the officinal portion, and state in what respects the two drugs differ from each other in their physical and chemical properties.

4. Give a brief description of the most important characteristics of the officinal varieties of Cinchona; name the plants from which they are obtained, and the alkaloids predominating in each variety.

5. Give the name, natural order and habitat of the Aconite Plant; describe the officinal parts, give their doses and name the characteristic alkaloids and acid found in them. From what common acid may the latter be obtained by the influence of heat?

6. What are Cloves? Give the name, natural order and habitat of the plant yielding the drug, its structural characteristics, and approximately the percentage of its most important constituents.

7. Hops. Give the name, natural order and part of the plant used; describe the drug, and state to which portion and which constituents the medical properties are mainly due.

8. Give the name, natural order and habitat of the plant yielding Colchicum Seed, and the time of their collection. Describe them, and give their medicinal properties and dose, and the characteristic tests for their alkaloid.

9. What are Turpentines, and what causes the opaque sediment in some varieties? State how the different kinds are procured and how the officinal resins of Coniferæ are prepared.

10. Give the characteristics of the natural order of *Lobeliaceæ*, and describe the officinal herb of this order, giving name and habitat.

QUESTIONS ON PHARMACY.

1. Define Specific Gravity, and state its uses in Pharmacy. A bottle holds half a pint of the liquid adopted as the sp. gr. standard, it holds at the same temperature 4,557 grains of an officinal liquid; what is that liquid? Show the method of obtaining your answer.

2. What is the value in English weights and measures of the Gramme, Litre and Metre? Give the names and value in the metrical system of the prefixes used in multiplying and dividing the Gramme.

3. Define the process of Percolation. State the reason why certain kinds of drugs are required to be finely powdered and others coarsely powdered, naming examples of each.

4. Give three officinal methods of preparing Medicated Waters, illustrating each with an example from the "Pharmacopœia."

5. What is an Emulsion? Give the ingredients in Mistura Asafoetidæ, Mistura Chloroformi and Mistura Ferri Comp. State what chemical reaction takes place in the latter preparation.

6. Give the ingredients in the following officinal preparations: Compound Infusion of Gentian, Aromatic Syrup of Rhubarb, Compound Tincture of Benzoin, Compound Powder of Rhubarb, Wine of Opium.

7. Why are the following substances used in their respective preparations? Carbonate of Magnesium in Syrupus Zingiberis; Boiling Hot Water in Unguentum Potassii Iodidi; Compound Spirit of Lavender in Liquor Potassii Arsenitis; Nitric Acid in Liquor Ferri Chloridi; Aromatic Sulphuric Acid in Infusum Cinchonæ Rubræ.

8. Give the process for preparing Atropia, the test for it and its principal use in medicine.

9. State the proportions and doses of the officinal Liquid Preparations of Opium.

10. What are the best tests for recognizing Gallic Acid, Conia, Meconic Acid, Strychnia and Quinia?

QUESTIONS BY THE EXAMINING COMMITTEE.

1. Why is Aqua Ammoniæ used in the preparation of Purified Muriate of Ammonia; Muriatic Acid in Purified Animal Charcoal; Soap in Pills of Aloes; and Sulphate of Potassium in Dover's Powder? Give the reason why Blistering Cerate is kept in the liquid state for half an hour.

2. From what plant are Belladonna Leaves and Root obtained? and what alkaloid do they contain? Give an outline of the formula for the production of all the officinal preparations, with the exception of the alkaloid, and the doses of those used internally.

3. Describe Mercury as found in the shops; state four of the different preparations it enters into in the metallic state; and specify the ingredients contained in each.

4. Give the locality, natural order and officinal name of the plant yielding Copaiba. State how it is obtained and what are its two principal constituents. Name its two officinal preparations.

5. State what doses of the following may be administered, and name the antidotes for poisonous doses of the same: Extract of Opium, Nitrate of Silver, Lupulin, Sulphate of Sodium, Sulphate of Iron, Acetate of Lead.

6. State the proper methods of detecting adulterations of Oil of Wintergreen with Alcohol, Chloroform with Alcohol, Oil of Lemon with Castor Oil, Yellow Wax with Paraffin, and Iodide of Potassium with Bromide of Potassium.

7. State the composition and correct officinal title of the following: Brown Mixture, Seidlitz Powders, Compound Extract of Colocynth and Compound Cathartic Pills. Write the Pharmacopœia formula for the latter in Latin, avoiding abbreviations.

8. State the formula for preparing Liquor Ferri Subsulphatis. Give its color, consistency, taste and specific gravity. Does it mix in all proportions with Water and Alcohol without decomposition? What effect is produced by the addition of Aqua Ammoniæ? By what *popular* name is this solution known?

9. State whether the following *prescriptions* A. B. C. D. are proper to be dispensed, and if not, give the reason why?

A.

℞—Strychniæ Sulphatis, gr. xxx.
Syrup. Zingiber., . . fℨi.
Aquæ, ... fℨv.
Misce.
Sig. A teaspoonful thrice daily.

B.

For Dysentery.

℞—Pulv. Opii.
Pulv. Ipecac.
Hydrarg. Bichlorid: . ää gr.iii.
Pulv. Acaciæ.
Syrup. . . . ää q.s.
Misce et fiat massa in pil. iii dividenda.
Sig One to be taken at bed-time.

C.

℞—Ammoniæ Muriat., . ℨss.
Antim. et Potass. Tart., gr.i
Tinc. Opii Deod., . fℨii.
Mist. Glycyrrh. Comp., fℨviii.
Misce fiat mist.
Sig. A dessert spoonful every three hours.

D.

℞—Hydrarg. Chlorid. Mit., gr.v.
Pulv. Ipecac. Comp., . ℨi.
Misce.
Sig. Take at bed-time.

10. Translate the following:

E.

℞—Quiniæ Sulphatis
Ferri Sulphatis Exsiccati ää, gr.i.
Extract. Nuc. Vomicæ, gr.½
M. ft. pilula; dentur tales doses No. xx.

F.

Transpose this into Troy Weight.

Grammes.

℞—Aloës Pulv.....2.
Hydrarg. Chloridi Mit. 0.75
Resin. Podophylli.....0.125
M. ft. pil. No. xii.

G.

℞—Extract. Belladonnæ, . gr.iii.
Tinct. Ferri Chloridi, . fℨiv.
Syrupi, . . . fℨss.
Mucilag. Acaciæ, . . fℨiv.
Sig. Take a teaspoonful on going to bed.

N. B.—Give your opinion of this prescription, and state what will be its condition when compounded.

H.

Write out a prescription having for a basis four fluid ounces Syrup of Tolu, containing in each teaspoonful one-eighth of a grain of Sulphate of Morphia and four minims of Tincture of Aconite Root.

The specimens submitted for recognition, 15 minutes being allowed for each set, were as follows:

Chemistry.	Materia Medica.	Pharmacy.	Examining Committee.
Acid. nitromuriaticum.	Calumba.	Ergotæ pulvis	Potassii chloras.
Potassii bromidum.	Scilla.	Infus. Rosæ comp.	Sodii boras.
Potassii nitras.	Guaiaci lignum.	Acetum Scillæ.	Uva ursi.
Sodii carbonas.	Juglans.	Syrup. Pruni Virg.	Coriandrum.
Sodii hyposulphis.	Hyoscyami folia.	Ext. Taraxaci fluid.	Pulv. Jalapæ Cp.
Ammonii chloridum.	Senna, Bombay.	Liquor Calcis.	Mist. Potassii Citr.
Magnesii sulphas.	Anisum.	Spir. Ammoniæ arom.	Tinct. Cinchonæ comp.
Cupri sulphas.	Sinapis alba.	Ung. Zinc oxidi.	Tinct. Opii Camph.
Plumbi acetas.	Sabadilla.	Acid. tannicum.	Extr. Sennæ fluid.
Alcohol.	Kino.	Cinchoniæ Sulph.	Ung. Hydrarg. oxidi rub.

The following gentlemen, having passed a successful examination, were recommended for the degree of Graduate in Pharmacy (Ph.G.). The names are in the order of merit, as ascertained from the examinations:

	Names.	State.	Subject of Thesis.
1	Joseph LeRoy Webber,	Massachusetts.	*Assay of Atropia.*
2	Henry Schroeder,	Illinois.	*Triosteum.*
3	John Ritter,	"	*Syrup of Wild Cherry Bark.*

4	Louis Emanuel,	Pennsylvania.	*Glycerin as an Excipient for Pill Masses.*
5	Albert Hapgood Van Gorder,	Ohio.	*Asarum Canadense as an Indigenous Aromatic.*
6	Isaac Rouland Diller,	Illinois.	*Tinctura Ferri Chloridi.*
7	James Oscar Burge,	Kentucky.	*The Chemical Laboratory.*
8	William Poole,	Delaware.	*The Strength of Saccharated Pepsin.*
9	John Alfred Witmer,	Pennsylvania.	*Tobacco.*
10	Henry Trimble,	"	*Benzoic Acid as an Antiseptic.*
11	William Duffield Robinson,	"	*Tinctura Cinchonæ Composita.*
12	Joseph John Brown,	Ohio.	*The Alcoholic Strength of Wine.*
13	John Chrysostom Martin,	Pennsylvania.	*Pharmaceutical Science.*
14	William Peiffer Weiser,	"	*Eucalyptus Globulus.*
15	Howard Buckman Sides,	"	*Chemical Action.*
16	Walter Adolphus Taylor,	Georgia.	*Extractum Gossypii Radicis Fluidum.*
17	Theodore Corson Wheaton,	New Jersey.	*Carya Porcina.*
18	Louis Von Cotzhausen,	Wisconsin.	*Coumarin—its uses and sources.*
19	William Wesley Trout,	Pennsylvania,	*Aquæ Medicatæ.*
20	Francis Marion Murray,	Ohio.	*Agave Americana.*
21	Daniel Conrad Gentsch,	"	*Glycerin.*
22	Wm. Norwood Kelly Boileau,	Pennsylvania.	*Wax—Adulteration and Pharmaceutical uses.*
23	Thomas Albert Huston,	Ohio.	*Polygonum Punctatum.*
24	Hugh White,	Pennsylvania.	*Pyrethrum Roseum.*
25	Ebenezer Miller Wells,	Mississippi.	*Cincho Quinine.*
26	William Ruff,	Ohio.	*Iodine.*
27	Charles Augustus Brotherline,	Pennsylvania.	*Phosphorus Pills.*
28	William Henry Righter, Jr.	Delaware.	*Preservation of Syrup of Ipecacuanha.*
29	George Joseph Mitsch,	Minnesota.	*Patent Medicines and an Analysis of Face Lotion.*
30	Flavius Saunders Case,	Ohio.	*Salicylic Acid.*
31	Hugo Franklin Baur,	Wisconsin.	*Mucilago Acaciæ.*
32	Walter Theron Baker,	Pennsylvania.	*Medicinal Waters.*
33	Charles William Tobey,	Ohio.	*Pharmacy*
34	Emil Louis Boerner,	Iowa.	*Ricinus Communis.*
35	Charles Albert Daniel,	Pennsylvania.	*Preparations of Calamus.*
36	Joseph Collard Rogers,	New Jersey.	*Domestic Remedies.*
37	Carl Swante Nicanor Hallberg,	Sweden.	*Pharmaceutical Notes.*
38	Clarence Henderson Risk,	Pennsylvania.	*Dispensing Poisons.*
39	Henry Tower Hayhurst,	Iowa.	*Effervescing Preparations of Sodium Tartrate.*
40	Carl Heinrich Marquardt,	Wisconsin.	*Iris Versicolor.*
41	George Blake Holden,	Massachusetts.	*Oleum Morrhuæ.*
42	Philip Jacob Laver,	Ohio.	*Solubility of Drugs.*
43	John Behlar,	District Columbia.	*Pimpinella Anisum.*
44	Francis Abraham Roepper,	Pennsylvania.	*Iron and its Properties.*
45	Charles Griffith,	"	*A Substitute for Volatile Liniment.*
46	Charles Moenkemoeller,	West Virginia.	*Cinchona and its Alkaloids.*
47	Andrew Richard Porter,	Indiana.	*Sium Latifolium.*
48	Charles Williams Warrington,	New Jersey.	*The Privacy of the Prescription Department.*
49	Joseph Wayne Merritt,	"	*Salicylic Acid.*

50	Benjamin Thomas Creighton,	Ohio.	*The Culture of Tobacco in Ohio.*
51	Clayton Kerper Smith,	Pennsylvania.	*The Relation and Commercial Value of Fluid Extracts.*
52	Charles Drum Lippincott,	"	*Fixed and Volatile Oils.*
53	Harry Calvin Watt,	"	*Fluid Extract of Ipecacuanha.*
54	Frank Edward Stewart,	New York.	*Lac Vaccinum—its Adulteration and Preparation.*
55	Alphonso Albert Willits Bley,	Pennsylvania.	*Honey.*
56	Theodric Linthicum,	Arkansas.	*Monobromated Camphor.*
57	Richard Miller Sommers,	New Jersey.	*Menispermum Canadense.*
58	Henry Louis Von Wittkamp, Jr.	Pennsylvania.	*Pharmacy.*
59	George Washington Kram,	"	*Disguising Disagreeable Remedies.*
60	Charles Eugene Hornberger,	Germany.	*The Discovery of Glass.*
61	Alvin Henry Keller,	Pennsylvania.	*The Science of Pharmacy in the Country.*
62	Ernest William Herrman,	"	*Tin Scrap.*
63	John Dowling Groves,	Pennsylvania.	*On Iodine.*
64	Philipp Henry Dilg,	Wisconsin.	*Euphorbia Ipecacuanha.*
65	William Fullerton Fleming,	Canada.	*Cortex Liriodendron Tulipiferæ.*
66	Theophilus Niblow Corbyn,	Pennsylvania.	*Proprietary Medicines.*
67	Oliver Paschal Hooper,	Maryland.	*Phytolacca.*
68	John Henry Evans,	Pennsylvania.	*Carbon.*
69	Franklin Pierce Louderbough,	Delaware.	*Solubility and Uses of Salicylic Acid.*
70	John William Sonnick,	New York.	*Syrupus Rhei Aromaticus.*
71	Willis Brenton,	Pennsylvania.	*Cryolite.*
72	Thomas Swaim Armstrong,	New Jersey.	*Guarana.*
73	C. Massey Cresson Durborow,	Pennsylvania.	*The Deterioration of the Druggists' Stock.*
74	George Lewis Sandt,	"	*Styrax Benzoin.*
75	Robert August Koempel,	Germany.	*Red Wine.*
76	Jacob Loudenslager Kolp,	Pennsylvania.	*Gelsemium Sempervirens.*
77	Irvin Railey,	Kentucky.	*The Apothecary.*
78	William Henry Robbins,	Pennsylvania.	*Turiones Asparagi.*
79	Howard Granville Shinn,	New Jersey.	*Convolvulus Panduratus.*
80	Frederick Stryker Boisnot,	"	*Suppositories.*
81	Leon Joseph K. Graber,	Pennsylvania.	*Opium, its Uses and Abuses.*
82	Edmund Rudolph Gatchel,	"	*Amylum.*
83	Louis Philip Carbonell,	Cuba.	*Acidum Lacticum.*
84	David Abraham Rosenthal,	Pennsylvania.	*The Wholesale and Retail Druggist.*
85	John William Quinn,	Ohio.	*Opium.*
86	Zachary Taylor Anstett,	Pennsylvania.	*Aristolochiaceæ.*
87	Jeremiah Dull McFerren,	"	*Responsibilities and Requirements of a Pharmacist.*
88	Ezra Heiry Gingrich,	"	*Chemical Changes.*
89	Albert Livingston Thorn,	New Jersey.	*Adulterations.*
90	James Henry Sheridan,	Pennsylvania.	*Manufacture and Uses of Oxide of Zinc in Medicine.*
91	Morrison Wright Webb,	Ohio.	*Patience and Care* vs. *Knowledge.*
92	Winfield Scott Taylor,	New Jersey.	*Dispensing Pharmacy.*
93	Daniel Albert Bowen,	"	*Podophyllum.*
94	Francis Henry Poley,	Pennsylvania.	*Aesculus Hippocastanum.*

95	Milbourn Asbury Toulson,	Maryland.	*Arnica Montana.*
96	Robert McNeil, Jr.,	Pennsylvania.	*Prescriptions.*
97	Otto Fürchtegott Koehler,	Germany.	*Iodinum.*
98	Charles Lashell,	Pennsylvania.	*Botany.*
99	Isaiah Henry Schuyler Kindig,	"	*Percolation.*
100	William Wood Stockton,	New Jersey.	*Trifolium Pratense.*
101	Charles Green Harris,	Iowa.	*Tinctura Ferri Chloridi.*
102	Wilbur Winthrop Fry,	Pennsylvania.	*A Thesis Dedicated to the Centennial Class.*
103	Allen Spengler,	"	*Preservation of Syrups.*
104	John Rufus Barr,	"	*Triticum Repens.*

Mr. Chipman Botsford, Canada (Podophyllum peltatum), passed the examination, entitling him to the Certificate of Proficiency in Chemistry and Materia Medica, which was granted by this College for the first time.

The Academy of Music was well filled with an appreciative audience on the evening of March 14th, to witness the Commencement ceremonies, which were enlivened by excellent music from the Germania Orchestra, George Bastert, Conductor. Many Commissioners representing foreign countries at the approaching Centennial Exposition were present upon the stage. The President of the College, Dillwyn Parrish, conferred the degree upon the above-named gentlemen, after which Professor Bridges presented the Procter prize, which had been awarded to Mr. Joseph LeRoy Webber, of Springfield, Mass. The requirements for obtaining this prize have been fixed by the Board of Trustees as follows: The candidate must have obtained the highest average in the class; the examinations in each one of the three branches and by the Examining Committee, as well as the recognition of specimens, must have been attended with such success as to merit, in each case, the predicate *very satisfactory*; in addition thereto, the candidate must have presented a satisfactory thesis. The prize consists of a gold medal and a certificate, with an appropriate inscription and a representation of the medal.

The valedictory address was delivered by Professor Remington, after which Mr. T. S. Armstrong, on behalf of the graduating class, presented to the College a complete polariscope attachment for the oxy-hydrogen lantern in use for illustrating the lectures. Vice-President Chas. Bullock received the gift on behalf of the Board of Trustees.

A large number of bouquets, books and other presents, which had been sent upon the stage, were distributed at the close of the exercises.

The Alumni Association of the Philadelphia College of Pharmacy held its annual meeting on Thursday, March 9th, when the following officers were elected: President, G. W. Kennedy; Vice Presidents, E. M. Boring and Samuel Campbell; Recording Secretary, Wallace Procter; Corresponding Secretary, Chas. L. Mitchell; Treasurer, Edw. C. Jones; to fill vacancies in the Executive Board, A. W. Miller, M.D., and Howard G. Jones; Trustee of the Sinking Fund, Thos. S. Wiegand.

On the evening of March 13th, the Association tendered a reception to the graduating class and their friends, at the hall of the College, the retiring President, Dr. A. W. Miller, in the chair. The recent graduates, having been formally admitted

to membership, Chas. L. Eberle, Ph.G., delivered the annual address. The alumni prizes were then distributed, Mr. J. L. Webber receiving the gold medal, and Messrs. H. Schroeder, L. Emanuel and J. Ritter the Alumni Certificates, for having received the highest average in Chemistry, Materia Medica and Pharmacy. To give to the older graduates and other friends present an opportunity of witnessing the working of the oxyhydrogen lantern as a means of instruction, Professor Remington exhibited with it a number of crystallizations and color reactions, and Prof. Maisch photographic representations of starches and other pulverulent drugs, and, with the microscope attachment, sections of a number of drugs. Mr. Bullock entertained the company by showing a large number of scenes of this and of foreign countries.

THE NEW YORK COLLEGE OF PHARMACY held its Forty-sixth annual commencement on the evening of March 21st, at Chickering Hall, when President P. Balluff conferred the degree of Graduate in Pharmacy upon the following gentlemen:

Adolph Basora, Santiago, Cuba,
Lewis Blumauer, Portland, Oregon,
Clarence F. Booth, Newport, R. I,
James P. Boyle, New Canaan, Conn.,
Augustus R. Castano, New York,
H. Lieber Coit, Newark, N. J.,
Albert Dovell, Newark, N. J.,
George Eberhardt, Rutherford Park, N.J.,
Frank H. Falkenreck, Elizabeth, N. J.,
George C. Fountain, Jersey City, N. J.,
Otto T. Frohwein, Elizabeth, N. J.,
Albert T. Gunther, Newark, N. J.,
John C. Heidingsfelder, New York,
Adolph Henning, Union Hill, N. J.,
Frederick Huehne, Rondout, N. Y.,
Gilbert P. Knapp, New York,
Otto G. Laue, Passaic, N. J.,
Henry Lehman, New York,
William J. Liell, New York,
Alexander M. Linnett, Newark, N. J.,
William Maass, Ixonia Center, Wis.,
Thomas J. Magee, New York,
Ewen McIntyre, Jr., New York,
James Millar, New York,
James K. Morrill, Holyoke, Mass.,
Adrian Paradis, Union Hill, N. J.,
George F. Payne, Macon, Ga,
Henry F. Pembleton, Brooklyn, N. Y.,
Benjamin F. Quackinbush, New York,
Gustavus Rothe, Jersey City, N. J.,
Henry C. Schranck, Milwaukee, Wis.,
Peter J. Schumann, Atlanta, Ga.,
Theodore A. Spear, New York,
Louis L. Staehle, Newark, N. J.,
Henry A. Striker, Amsterdam, N. Y.,
Theodore Thieme, Fort Wayne, Ind.,
Joseph E. Tomas, Brooklyn, N. Y.,
William H. Townsend, New York,
John H. Wenzel, New York.

The Alumni Prizes were awarded by Professor Bedford, after which Professor E. Curtis, M.D., delivered an address, and Mr. H. L. Coit the Valedictory Address on behalf of the graduates.

THE ALUMNI ASSOCIATION OF THE COLLEGE OF PHARMACY OF THE CITY OF NEW YORK held its fifth annual meeting, Wednesday evening, March 15th, 1876, President Geo. C. Close in the chair. Some fifty members were present, and nineteen of the class of 1876 joined the Association.

The President, the oldest living graduate, read his annual address, and gave an

interesting account of the apothecaries and doctors who were prominent in this city when he graduated in 1831.

The Treasurer, Theobald Frohwein, reported $205.80 cash on hand, and $46.42 in the reserved fund. An election of officers was then held, which resulted in the choice of the following gentlemen: President, Ewen McIntyre. Vice-Presidents —Starr H. Huebler, Charles A. Robbins, Ph.D., Henry C. Schranck. Secretary, Prof. P. W. Bedford. Treasurer, Theobald Frohwein. Registrar, Lucien M. Royce. To fill vacancies in the Executive Board—Byron F. McIntyre, Thomas F. Main and Edward W. Runyon. Delegates to the American Pharmaceutical Association—Geo. C. Close, Theo. Frohwein, B. F. McIntyre, S. H. Ambler and L. M. Royce.

The President appointed the following Committees: On Papers and Queries—Messrs. Creuse, B. F. McIntyre and Runyon. On Publication—Messrs. Royce, Creuse and Ambler.

A letter of greeting from the Alumni Association of the St. Louis College of Pharmacy was read, and the Secretary was directed to write an appropriate reply, reciprocating the kind feelings expressed.

Prof. Bedford offered a resolution that the Association give in the future three medals, of gold, silver and bronze, to the students rating, respectively, first, second and third at the annual examination. The resolution was passed unanimously.

Mr. Creuse read a paper entitled "A New Explosive Mixture," which was referred for publication.

The meeting then adjourned to the College cabinet, where a bountiful collation had been prepared.

Prof. Bedford, on behalf of the Association, welcomed the class of 1876, who were the guests of the evening, telling them that on this occasion they might forget the caution taught by their motto, *cavendo tutus*, as there were no poisons here. After an hour very pleasantly spent, the company separated, well pleased with the work of the Committee on Entertainment.

The next meeting of the Association will be held in June, when the officers elect will be installed.

The New York Alumni Association of the Philadelphia College of Pharmacy held its monthly meeting March 7th, President Levering in the chair. Mr. Mitchell was elected a member. Nominations were made for officers, the election being held at the next meeting, April 4th.

Mr. Wood stated that hydrobromate of quinia, often erroneously called bromide of quinia, has been attracting attention of late, because of its ready solubility. Mr. Wellcome called attention to a paper read by Mr. Bullock, before the American Pharmaceutical Association, in which formulas are given for the preparation of many bromides and hydrobromates, the latter term being used for the compounds with alkaloids. Having been called upon to prepare a concentrated solution of quinia, to be used hypodermically for a patient unable to endure any other method of administration, he made a solution of *arabinate of quinia*, three minims containing one grain of the salt, which was used with convenience, causing no unpleasant effects locally, and giving satisfactory results in its action.

The subject of ointments was discussed at some length in relation to a suitable substitute for lard or simple ointment. Mr. Ritter (of the class of 1876, present on this occasion), had found a combination of white wax and castor oil to be not readily impaired, and furnishing a good substitute for compounds very susceptible to change. Glycerite of starch and glycerin, solidified with gelatin, were also discussed in this connection.

Mr. Wellcome reported the case of Hon. L. Porter, of Minnesota, who drank from a bottle supposed to contain currant wine, but when too late discovered that he had taken a draught of solution of corrosive sublimate, kept for killing bed-bugs, and containing about 15 grains of the poison. The administration of white of eggs, lard, &c., under the direction of skilled physicians, proved unavailing, and the patient died after five days' suffering.

Massachusetts College of Pharmacy.—At the annual meeting, held March 6th, the following officers were elected: President, Samuel M. Colcord; Vice-Presidents—Charles A. Tufts, Thomas L. Jenks; Corresponding Secretary, George F. H. Markoe; Recording Secretary, Daniel G. Wilkins; Treasurer, E. L. Patch; Auditor, W. S. Folger; Trustees—James S. Melvin, Henry W. Lincoln, B. F. Stacy, I. T. Learey, I. B. Patten, Henry Canning, S. C. Tozzer and George H. Cowdin. The affairs of the College were reported to be in a good condition. A new charter has just been obtained from the Legislature.

The St. Louis College of Pharmacy held its tenth annual commencement March 23, when President F. X. Crawley conferred the degree of Graduate in Pharmacy upon the following gentlemen: Flor. C. Schmidt, Robt. Hunstock, A. Ph. Kaltwasser, J. N. Washington, F. Westmann, O. E. H. Truetler, L. Riesmeyer, Chas. Luedeking, N. Guhmann, Jr., Paul Nake, Gust. Brandau, H. Schwarz, Herm. Brandt, Jr., and H. Harnisch.

Prizes were awarded by Prof. Good, and valedictories delivered by Prof. Fay on behalf of the faculty, and by Mr. Washington on behalf of the class.

The graduates were then received by the Alumni Association, and the exercises terminated with an oration by Francis Hemm, Ph.G.

EDITORIAL DEPARTMENT.

The Asserted Presence of Tannin in Gentian Root.—In a paper bearing this caption, published in our last number, we took occasion to refer to the report on a paper read before the Massachusetts College of Pharmacy, from which we were led to infer that the assertion concerning the presence of tannin in gentian was mainly based on the incompatibility of the tincture of chloride of iron and compound tincture of gentian. Mr. E. L. Patch has kindly sent us the paper read by him, from which it is evident that the report referred to above was very incomplete, and that the experiments with gentian alone were in reality the most important of his investigations, the results of which agree entirely with those related in our last number. Mr. Patch had *not* overlooked the fact that orange peel produces

an inky coloration with salts of iron; he ascertained, even, that its infusion yields a slight precipitate with gelatin; he likewise noticed that the same reagent produces with infusion of gentian a slight precipitate, which at first sight may readily be mistaken for tannate of gelatin, since, after draining, it will be colored nearly black by iron salts; this color, however, is completely removed by washing with cold water. A very interesting experiment, which, in our opinion, likewise disproves the presence of tannin, was performed by Mr. Patch, by exhausting moistened gentian with washed ether and evaporating; the resulting extract was treated with alcohol, and this solution was found to behave to iron salts in a similar manner as tannin; yet, on throwing it into water and filtering, the clear liquid, which should contain any tannin present, was *not precipitated* by gelatin. In his paper Mr. Patch stated that he did not regard his experiments as concluded, but would continue his investigations. Since then, Mr. L. D. Drury has read a paper before the Massachusetts College of Pharmacy, in which he arrived at the same conclusion as the paper published in our last number.

THE PILL QUESTION.—On February 18th, we received a communication from Mr. Dunton, which we could not notice in our last number, and in which he objects to the conclusions arrived at by Mr. Remington in his paper read before the American Pharmaceutical Association. The points relating to the question at issue are contained in the following:

In 1869 I called the attention of the medical profession to the advantages of the compressed pill, viz. that—

First. No extraneous substances are added to produce cohesion, such as gum, sugar, starch, soap, &c., which are usually employed in making up pill masses, and often detract from the solubility of the pill, while they add to its bulk.

Second. Their form is lenticular instead of round; they consequently present a larger surface to be acted upon, and are more promptly effective. Experience has shown, also, that pills in this shape are very easily swallowed.

This statement in reference to the solubility of the pill was made after a full examination of the subject, by frequent comparative tests, made by myself or under my supervision, with pills made from every excipient known to us, and also with those purchased from leading pharmacies. Never, in any instance, did we find, under like circumstances, an excipient pill dissolved as soon as the non-excipient or compressed pill.

To avoid the republication of the entire paper, Prof. Remington has, at our request, embodied in his reply to Mr. Campbell the essential portions of his paper, so as to enable every intelligent reader to form a judgment, or to repeat the comparative experiments for himself. With these remarks we feel that we can leave the matter to the decision of our readers.

THE DRUGGISTS OF MINNESOTA, we have been informed, are taxed under a State law ten dollars each, for the support of the State Inebriate Asylum. Why the Solons of that State have specially selected the druggists for such forced contributions is unknown to us. It cannot be that, as a class, they are guilty of keeping tippling-houses, nor because, under the internal revenue law of the United States, apothecaries and druggists are compelled to take out a liquor dealer's license. The druggists have recently assembled at Minneapolis to protest against that law as an outrage; and in their attempt to secure its repeal deserve the good wishes of all.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

Medicinal Plants; being Descriptions with Original Figures of the Principal Plants employed in Medicine, and an Account of their Properties and Uses. By Robert Bentley, F. L. S., and Henry Trimen, M. B., F. L. S. Philadelphia: Lindsay & Blakiston, 1876. Price of each part, $2.00.

Parts 2d and 3d of this valuable work, now before us, contain figures and descriptions of the following North American plants: Lobelia inflata, Gaultheria procumbens and Sanguinaria canadensis. The remaining plants noticed in the two parts are Theobroma cacao, Rhamnus catharticus, Prunus amygdalus, Pyrus cydonia, Cinnamonum zeylanicum, Papaver rhœas, Barosma crenulata, Citrus aurantium, Olea europæa, Juniperus communis and Iris florentina.

We notice that the fusing point of cacao butter is given at 122° F., and its specific gravity ·961. Other authorities give the spec. grav. ·891 to ·91, and the fusing point at about 30° C.,(96°F.)—See also Trojanowsky, next page. While it is not unlikely that different varities of cacao, expressed at different temperatures may yield fats varying in fusing point and density, we are not aware of any comparative experiments undertaken with the view of ascertaining the causes producing the differences which are noticed between the cacao butter of former investigators and that usually met with in commerce.

Among the constituents of sanguinaria, puccina and sanguinarinic acid are given, the former of which Hopp proved to be (*Amer. Jour. Phar.*, 1875, p. 193,) sanguinarina mixed with a little resin, and the latter to consist mainly of citric and malic acids.

The representations of the plants and the descriptive letter-press are very commendable.

Gmelin — Kraut's Handbuch der Chemie. Anorganische Chemie. Sechste umgearbeitete Auflage. Heidelberg: Carl Winter's Universitäts Buchhandlung.

We have before us Nos. 6 to 10 of vol I. part I; Nos. 5 and 6 of vol. II, and Nos. 17 to 20,—the conclusion of the third volume.

The five numbers belonging to the first volume contain the continuation of the general and physical chemistry, among which is the chapter on crystallography and an exposition of the physical laws bearing on solids and liquids, and relating to elasticity, expansion, density, influence of and behavior to heat, dissociation, capacity of absorption and solution, etc.

The two numbers of the second volume are devoted to the metals of the alkaline earths barium, strontium and calcium, and the concluding numbers of the third volume to the metals of the platinum group, namely, platinum, palladium, rhodium, iridium, ruthenium and osmium. The preparation of the last volume for the press consumed a period of over four years, and has been in the hands of Professor S. M. Jörgensen, of Copenhagen, who has admirably fulfilled his trust to bring the work up to the time of publication, which, in view of the numerous additions and of the more extended and perfected theoretical knowledge necessitated the re-writing of the greatest portion of the work. The same must be said of the second part of the first volume, containing the non-metallic elements, which was finished some time ago, having been revised by Professors H. Ritter and Carl Kraut. What remains to be finished is the first part of the first volume, containing the general introduction into chemical science, and the second volume embracing the metals of the alkalies, alkaline earths and earths. The former, of which now ten numbers (608 pages) have been published, is entrusted to Professor A. Naumann, of Giessen, a scientist eminently qualified for the task from his connection with the "Jahresbericht der

Chemie," (annual report on the progress of chemistry) for which he has elaborated the same branch since 1867. The second volume is in charge of the editor of the entire work, Professor Kraut, of Hannover, who completed Gmelin's organic chemistry with its supplements in 1870. The completion of the inorganic chemistry may now doubtless be looked for in a short time.

Ueber die wesentlichen Bestandtheile von Gelsemium sempervirens. Von Dr. Chas. A. Robbins. Berlin, 1876.

On the proximate principles of Gels. sempervirens.

The results of the author agree in the main with those previously obtained by Professor Wormley (*Amer. Jour. Phar.*, 1870, p. 1,). The gelseminic acid of the latter was found by Dr. Robbins to be identical with aesculin, and the amorphous gelseminia, for which the empirical formula $C_{11}H_{19}NO_2$ was obtained, was observed to have the reactions noticed by Wormley; but a solution of gelseminia in concentrated sulphuric acid acquires, on the addition of potassium bichromate, particularly at the place of contact, a very characteristic cherry-red color having a tint of violet and changing to blueish-green. The sulphuric acid solution of gelseminia spread over a porcelain plate acquires, on the addition of ceroso-ceric oxide, a rose-cherry red color surrounding the oxide, and spreading over the entire surface after stirring with a glass rod. This reaction is quite characteristic and very delicate.

The resins, freed from gelseminia, were found to be destitute of poisonous action upon rabbits and pigeons.

Ein Beitrag zur Pharmacognostichen und Chemischen Kenntniss des Cacaos. Von Piers Trojanowsky. Dorpat, 1875.

A Contribution to the Pharmacognostical and Chemical Knowledge of Cacao.

This inaugural dissertation, for which the experiments were made in Prof. Dragendorff's laboratory, treats, in the first part, of the pharmacognostical relations, giving brief historical notes, botanical accounts, notes on the culture and descriptions of the twenty commercial varieties investigated by the author.

The second, or chemical part, contains a review of the various analyses, which is followed by the quantitative determination of theobromina. This was effected by first treating the coarsely powdered material with petroleum benzin, to remove fat; the residue is then rubbed with powdered glass and water to a fine powder; magnesia is added, and the mixture dried below 70° C. This residue is exhausted with two portions of boiling alcohol, and the filtered solution evaporated; a little fat and a minute amount of a crystallizable body are removed by petroleum benzin, the undissolved portion washed upon a tared filter with alcohol until the filtrate is nearly colorless, and the residue weighed as theobromina; to this weight is added the amount of alkaloid dissolved in the alcoholic washings (1 in 1460). In this manner the author obtained from the cotyledons of a Domingo cacao 1·205 and from an African cacao 4·652 per cent. of theobromina. Different samples of the same commercial varieties yielded, however, very different amounts. The shells of the same varieties, mentioned before, gave respectively 2·056 and 4·540 per cent. of theobromina, the smallest yield being obtained from the shells of a Soconusco cacao =0·866 per cent.

The amount of fat obtained by petroleum benzin varied between 39·30 per cent. from a Carracas and 52·05 per cent. from a Surinam cacao. The fusing point of the cacao butter, determined in capillary glass tubes, varied between 30° C.=86° F. (Brazil cacao) and 32·8° C.=91° F. (St. Lucia cacao). To determine whether cacao butter has been adulterated with other fats, the author recommends the process proposed by Björklund, in 1864. Two grams of the fat are dissolved, by agitation, in a strong glass tube, in 4 grams of ether of 17° C (62·6 ° F.); the tube is

then immersed in water of 0° C. (32° F.) Pure cacao butter commences to separate granules after three (Para c.) or five minutes (Puerto Cabello and Caraccas c.), or the solution began to become turbid after eight (Trinidad, Guayaquil and Surinam c.), or fifteen minutes (Domingo c.) The solutions of Martinique and Bahia cacao butter remained clear after twenty-five minutes. If the cacao butter had been mixed with 5 per cent. of tallow, the etherial solution became turbid in one minute; 5 per cent. of suet rendered it turbid in 2½, 10 per cent. in 2, and 20 per cent. in one minute; with 40 per cent. suet, the solution became turbid at once in the cold water.

The amount of starch was determined as sugar, and found to vary between 2·23 (Para c.) and 6·65 per cent. (Soconusco cacao).

The author has also examined the behavior of the alcoholic tinctures of the different varieties to various reagents, and, based upon his results, suggests a method of determining the commercial variety of cacao from its behavior to such reagent.

The amount of ashes obtained from the cotyledons varied between 2·08 (St. Vincent c.) and 3·93 per cent. (Guayaquil c.). The shells yielded from 4·67 (Dominica c.) to 19.27 (Carracas c.) per cent. of ashes.

To determine the quality of chocolate, the amount of ashes must not much exceed 3 per cent., the fat (to be tested with ether, as above stated) not less than 40 per cent., and the starch not over 7 per cent., in all cases after deduction of the sugar.

Beiträge zur Chemie der Eichen-, Weiden- und Ulmenrinde. Inaugural Dissertation von Edwin Johanson. Dorpat, 1875. 8vo, pp. 94.

Contributions to the Chemistry of Oak, Willow and Elm Barks.

By his interesting experiments, the author has proven that the tannin of oak and willow barks may be made to yield a crystalline body which possesses all the reactions of gallic acid. Wagner's distinction, made in 1866, between a pathological and physiological tannin is therefore incorrect. By a similar treatment of the tannin from *Ulmus campestris* no crystalline body could be obtained. In the course of his investigation the author obtained from willow bark *benzohelicin*, which Piria gained in 1852 from populin by treatment with nitric acid. This is the first observation of the existence of this body in a plant.

Proceedings of the Seventh Annual Meeting of the California Pharmaceutical Society; also, of the Third Annual Meeting and Commencement Exercises of the California College of Pharmacy. San Francisco, 1875. 8vo, pp. 76.

The pamphlet before us contains, besides the minutes, officers' reports, prospectus, &c., two papers, read before the Society: "On Ethics of the Profession," by E. Painter, and "On Suppositories," by G. G. Burnett, the latter advocating their preparation from powdered cacao butter, by hand, with the aid of a spatula. A third paper, "On Syrup of Ferrous Iodide," by M. Tschirner, was published in this Journal last year (p. 249).

The commencement was noticed on page 572 of our last volume. In the pamphlet we find the valedictory address by Prof. Searby, and abstracts from two theses: "On Sesame Oil," by R. C. Meyers, and "On Oxytropis campestris," by T. D. Graham.

Wildungen, its Baths and Mineral Springs. By Dr. A. Stoecker. Translated from the German by Chas. Harrer, M. D. London: Trübner & Co.; New York: E. Steiger. 1875. Pp. 40.

The pamphlet gives a brief account of these well-known springs, their medicinal properties, composition, &c.